A PLAN FOR THE NARROW RIVER WATERSHED

Tri-Town Narrow River Planning Committee

RIVER LANDSCAPES
Roy Mann Associates, Inc.
Moriece & Gary, Inc.

June 1976

RIVER LANDSCAPES
A JOINT VENTURE
MORIECE & GARY and ROY MANN ASSOCIATES

June 30, 1976

Dr. Robert A. O'Neill, Chairman
Tri-Town Narrow River Planning Committee
c/o Planning Department
South Kingstown Town Hall
Wakefield, Rhode Island 02879

Dear Dr. O'Neill:

We are pleased to present to you and the Committee the accompanying printed copies of the Plan for the Narrow River Watershed, concluding the effort we began in constructive association with the Committee in 1975.

We believe our work has responded well to your interest in creating a comprehensive land use advisory plan that can encourage the Towns of Kingstown, South Kingstown and Narragansett to manage the resources of the watershed with ecological protection as a guiding principle. We further believe that the concepts and implementation tools we have proposed are both forward-looking and realistic and hope that they will be of considerable value to you in the future, in your efforts to promote a wiser stewardship of this most significant watershed.

Sincerely,

Roy Mann Associates

Roy Mann

Moriece and Gary, Inc.

Benjamin W. Gary, Jr.

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a plan for the Narrow River Watershed

prepared for:
TRI-TOWN NARROW RIVER PLANNING COMMITTEE
Narragansett, North Kingstown,
South Kingstown, Rhode Island

by:
River Landscapes/A Joint Venture
Roy Mann Associates, Inc.
Moriece & Gary, Inc.

June, 1976

PREFACE

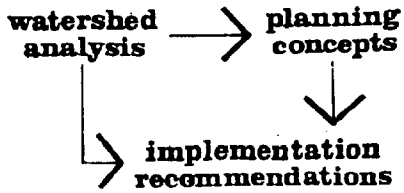
This study was commissioned by the Tri-Town Narrow River Planning Committee of Narragansett, South Kingstown, and North Kingstown, Rhode Island, with funds allocated by the three towns, the Narrow River Preservation Association, a matching grant from the Ford Foundation, and a planning grant through the state from the National Oceanic and Atmospheric Administration, U.S. Department of Commerce, under the provisions of the Coastal Zone Management Act of 1972. Additional contributions for printing costs of the study were made by the Dunes Club, Mettatuxet Yacht Club, and Pettaquamscutt Lake Club.

The interest in and guidance of this study by the Committee, by the numerous interested citizens who attended the public meetings or were contacted during the course of the study, and by the staff of local and state agencies have been greatly appreciated.

The study project directors were Roy Mann and Benjamin W. Gary, aided by the project staff of Mike Dana, Joan Dillon, Gail Promboin, Cindy Sarver, Gary V. Turner, and Susan Yaro.

contents

map list

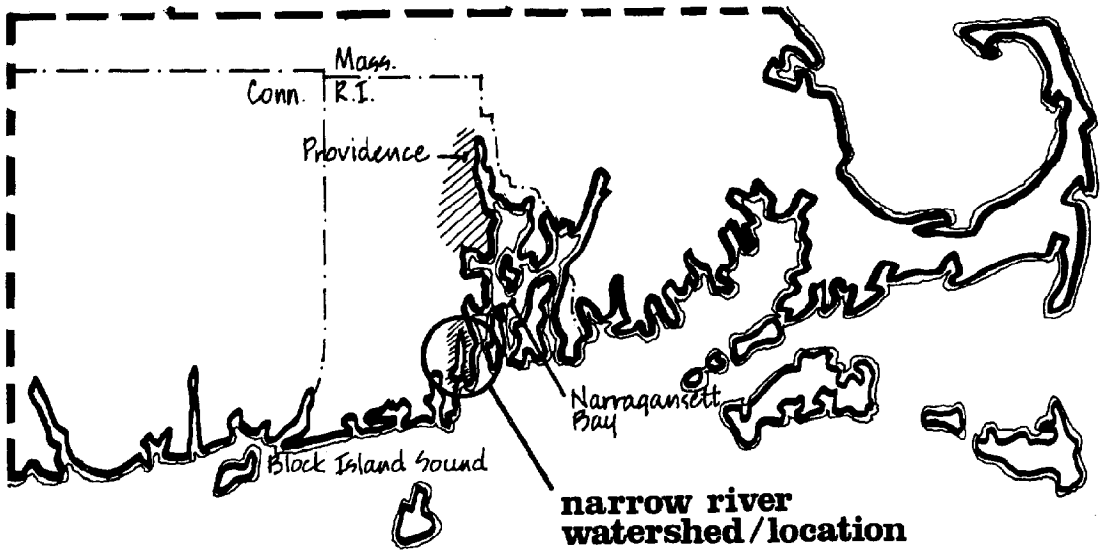


introduction

In 1975, the Tri-Town Narrow River Planning Committee was created by the Towns of South Kingstown, North Kingstown, and Narragansett, Rhode Island to sponsor the development of a comprehensive land use plan for the Narrow or Pettaquamscutt River watershed. The plan was to be "biased in favor of respecting the ecological integrity of the watershed" and oriented toward direct and specific recommendations that could be acted upon at the local level.

During the process of plan development, existing conditions were surveyed to identify the valuable resources of the watershed as well as the potential problems arising from their use or misuse. The Narrow River was found to be unique in the region and state in its estuarine system and relatively uncommon, among coastal edges of Narragansett Bay, in the extent of undeveloped upland areas. A continuation of existing development trends in the watershed could be potentially destructive of many of these natural watershed values. Community development can be accommodated, but should be controlled to prevent deterioration in environmental quality and patterned to enhance the quality of community life.

A concept plan was developed to respond to the uniqueness of the watershed as well as to the need to enhance the quality of community life.



The plan is designed to be carried out by the communities themselves, by individual owners, and by the agencies of the state with responsibilities for the watershed. The kinds of management actions that the plan recommends include both those measures which can be used in the present to deal with current problems, and those which should be developed over time to meet the challenges of growth and environmental use which are bound to emerge in the future. Implementation measures are presented as long-term strategies, for which the legal and technical framework may have to be developed, and as short-term, holding strategies that can be adopted within existing legal and policy frameworks.

summary of recommendations

The Narrow River watershed possesses many outstanding natural, scenic and cultural resources and should be granted special attention by the public, as well as private individuals, to ensure perpetration of the watershed's value to all.

Growth Management

Future watershed development should be guided to a small number of village centers and to the existing developed neighborhoods within which the centers would lie. The village centers could absorb moderately high densities, and adjacent existing neighborhood areas could achieve moderate densities through further infill. Growth should be discouraged in most other areas of the watershed.

- *Support state enabling legislation authorizing the use of cluster and planned unit development zoning provisions, and utilize these provisions to stimulate quality community design within village centers and adjacent neighborhoods.*

- *Utilize capital improvements programming, official mapping, and site plan review to promote compact growth within designated areas.*

- *Investigate the feasibility of using land banking and transfer of development rights in conjunction with existing land use controls to achieve compact village center growth, and to safeguard ample space outside of village centers for recreational, educational, and open space uses.*

Open Space, Recreation, and Scientific and Educational Assets

A balanced watershed growth policy affording development in suitable village and town areas and discouraging development from most presently undeveloped land will offer new opportunities for enjoyment and even moderate economic utilization of open lands. A portion or portions of the estuary should be protected as critical environmental areas or possibly as an estuarine sanctuary. The State can acquire key portions of an Upper River Park to supplement use of private open lands for camping, educational-scientific, and other low-intensity recreational and related pursuits. A Lower River Park, also encompassing both public and private lands, can help secure improved water access and wise utilization of foreshores and water-related uplands.

- *Explore all available federal, state, and local funding sources for the acquisition and development of such facilities particularly the federal coastal zone management program and Rhode Island Coastal Resource Management program.*

- *Promote watershed landowner interest in voluntary dedications of easements and restrictive covenants designed to supplement the open space acquisition programs and to protect the scenic values of the river corridor.*

- *Support and encourage the formation of a watershed land trust to solicit and maintain privately dedicated open space land.*

- *Support state legislation to strengthen the Farm, Forest and Open Space Act to increase its effectiveness as a land conservation program.*

Environmental Management

The lands, waters, and biological resources of the watershed should be protected and managed to safeguard ecological health as well as the health and safety of watershed residents.

- Adopt floodplain zoning bylaws to prevent additional encroachment on the Narrow River floodway and its intrinsic environmental resources. Encourage voluntary and assisted housing relocation.

- Establish a special zoning district and site plan review procedures to prevent or mitigate the adverse impacts of development on unsuitable soils or areas of steep slope.

- Study the need for treatment of urban runoff, particularly from the middle river area, and, to the degree necessary, require the provision of oil and grease traps, retention basins, and other ameliorative measures.

- Continue effective enforcement of sanitary codes and site suitability analysis requirements on all watershed lands.

- Encourage state and federal agencies to enforce watershed protection more effectively through existing permit systems and allied regulatory programs.

Appearance and Design

The natural and visual amenities of the Narrow River corridor are prime assets in the watershed and warrant increased consideration within existing and expanded regulatory programs. The following governmental actions are recommended:

- Establish special zoning and subdivision standards designed to restrict woodland cutting and thinning on all watershed lands, with additional control of these activities along water/land and wetland edges and on the river valley's bluff face and crest.

- Establish road corridor right-of-way maintenance programs designed to maintain and enhance scenic views.

- Adopt road corridor development standards including building setbacks, landscaping criteria, and signage controls to assure that future highway development compliments the scenic character of the watershed.

River Management and Use

The Narrow River should serve as a recreational and scenic corridor linking activity centers within the watershed. Local governments should:

- *Sponsor and/or support a program of spot dredging or reconstruction of Middlebridge Bridge to facilitate boat passage only after further study of the effectiveness, environmental effects, and feasibility of the alternatives.*

- *Discourage further marina and single lot dock development along the river through existing regulatory programs and Corps of Engineers application reviews.*

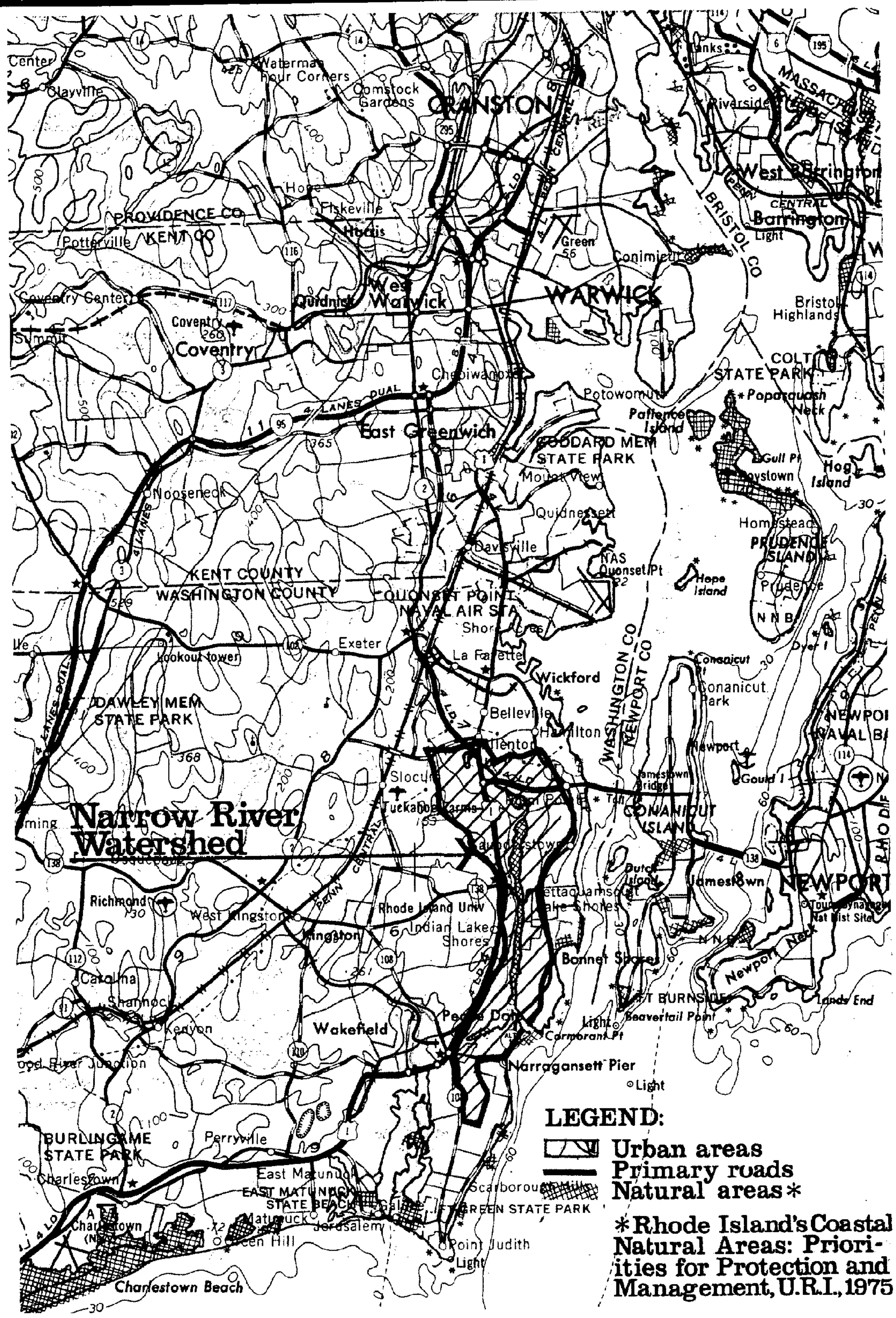
- *Develop streamside and bluff trails and access points where conditions permit.*

Organizational and Institutional Needs

Implementation of the watershed plan should be forceful, effective, and well-coordinated. The following actions are recommended:

- *The Tri-Town Committee should be reorganized or succeeded by a permanent intertown commission.*

- *Consideration should be given to creating a joint state-local watershed commission, patterned after the Adirondack State Park Agency of New York, authorized to carry out implementation of the plan.*



Regional Context

A PLAN FOR THE NARROW RIVER WATERSHED

Tri-Town Narrow River Planning Committee

The preparation of this map was financed in part through a planning grant from the National Oceanic and Atmospheric Administration, U.S. Department of Commerce, under the provisions of the Coastal Zone Management Act of 1972 (92-583). The remainder was financed by local, state and private funds.

NORTH

1

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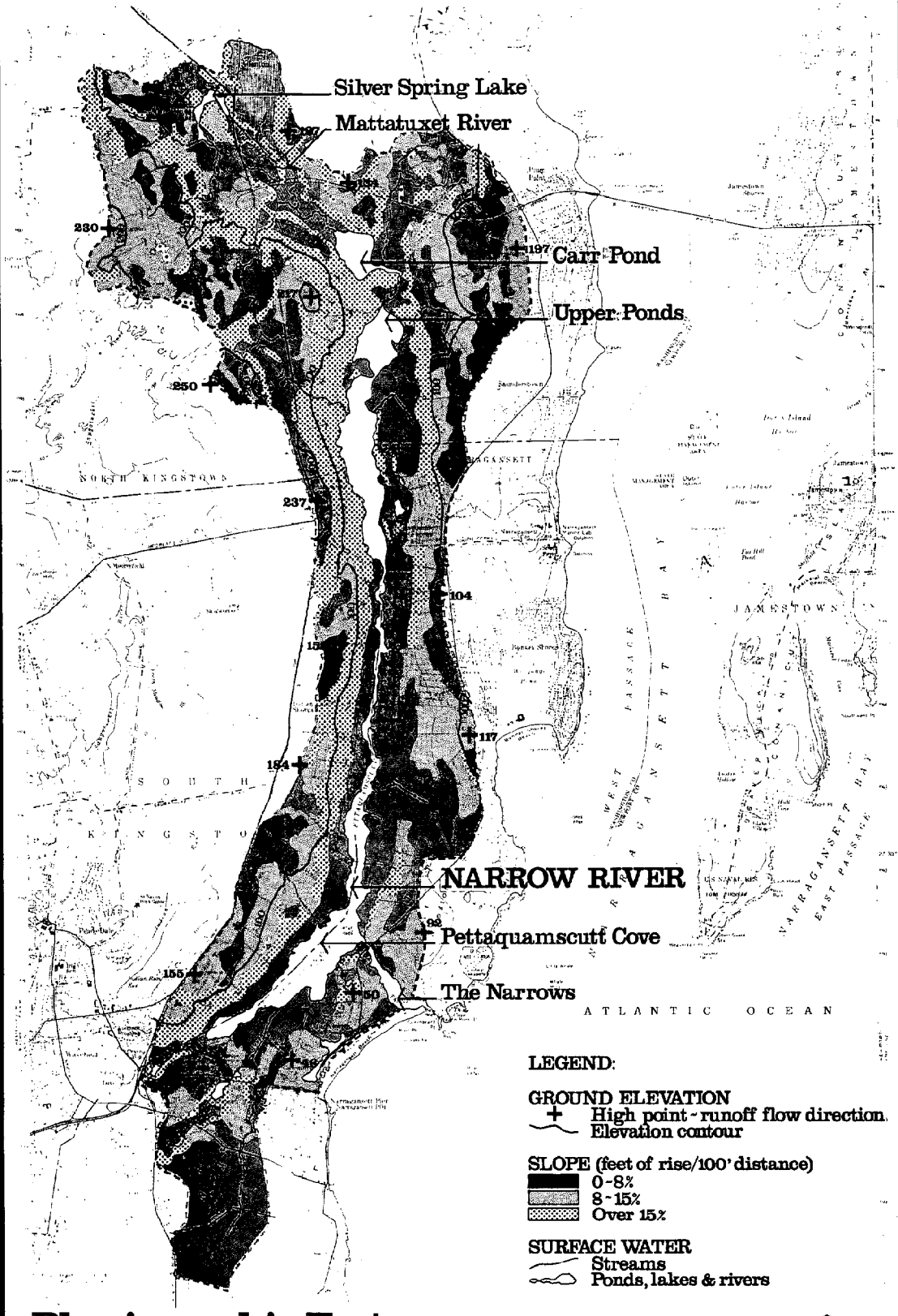

Physiographic Features

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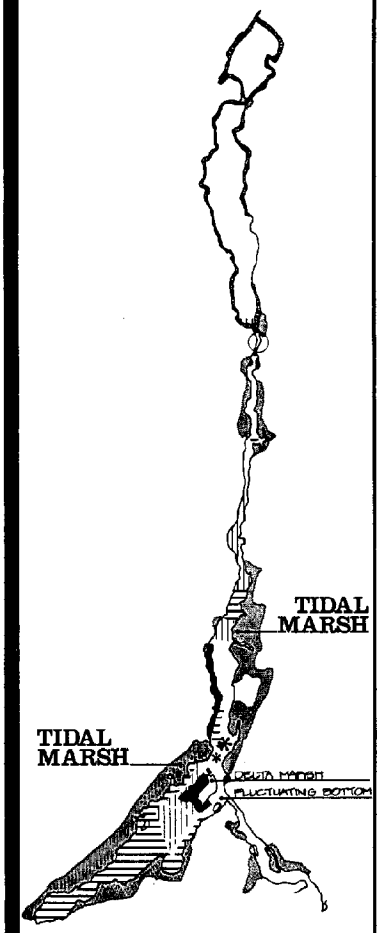
BIOTIC RESOURCES

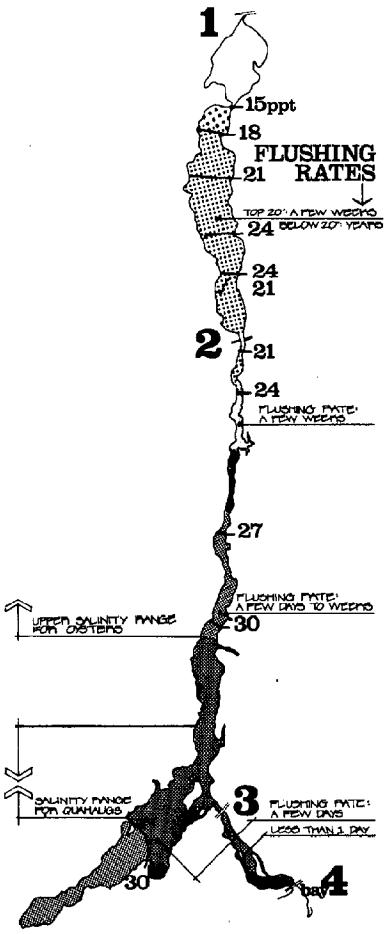


LEGEND:

BOTTOM SEDIMENTS
- Sand
- Silt & Sand
- Silt & Clay

SHELLFISH
- Quahaugs
- Oysters
- ○ Soft Clams
- ** Mussels

SALINITIES & TIDAL ACTION



TIDAL RANGES

location	spring	neap
1 →	5"	3"
2 →	6	4
3 →	20	15
bay 4	54	31

SALINITIES
(HICKS 1958)
Measurements taken when salinities were abnormally high.

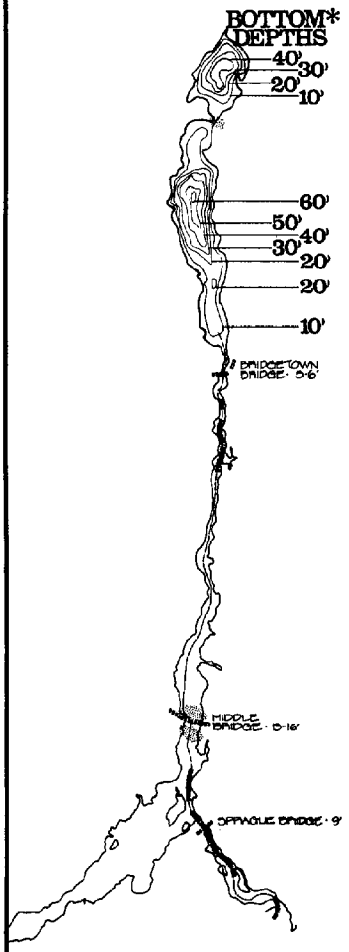
LEGEND:

BOTTOM SALINITY*
—30 Salinity contour & value

SURFACE SALINITY*
- Less than 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 33

*In parts per thousand

DEPTHS & SED~ IMENTATION



WATER QUALITY
(R.I. DEPARTMENT OF HEALTH 1967)
Sea Water Class SA: Suitable for all sea water uses including shellfish harvest for human consumption, bathing, & other water contact sports.

*GAINES 1975, R.I. Department of Natural Resources

LEGEND:
- Exposed bars
- Channel 2-4' deep
- Channel over 4' deep

Estuarine System

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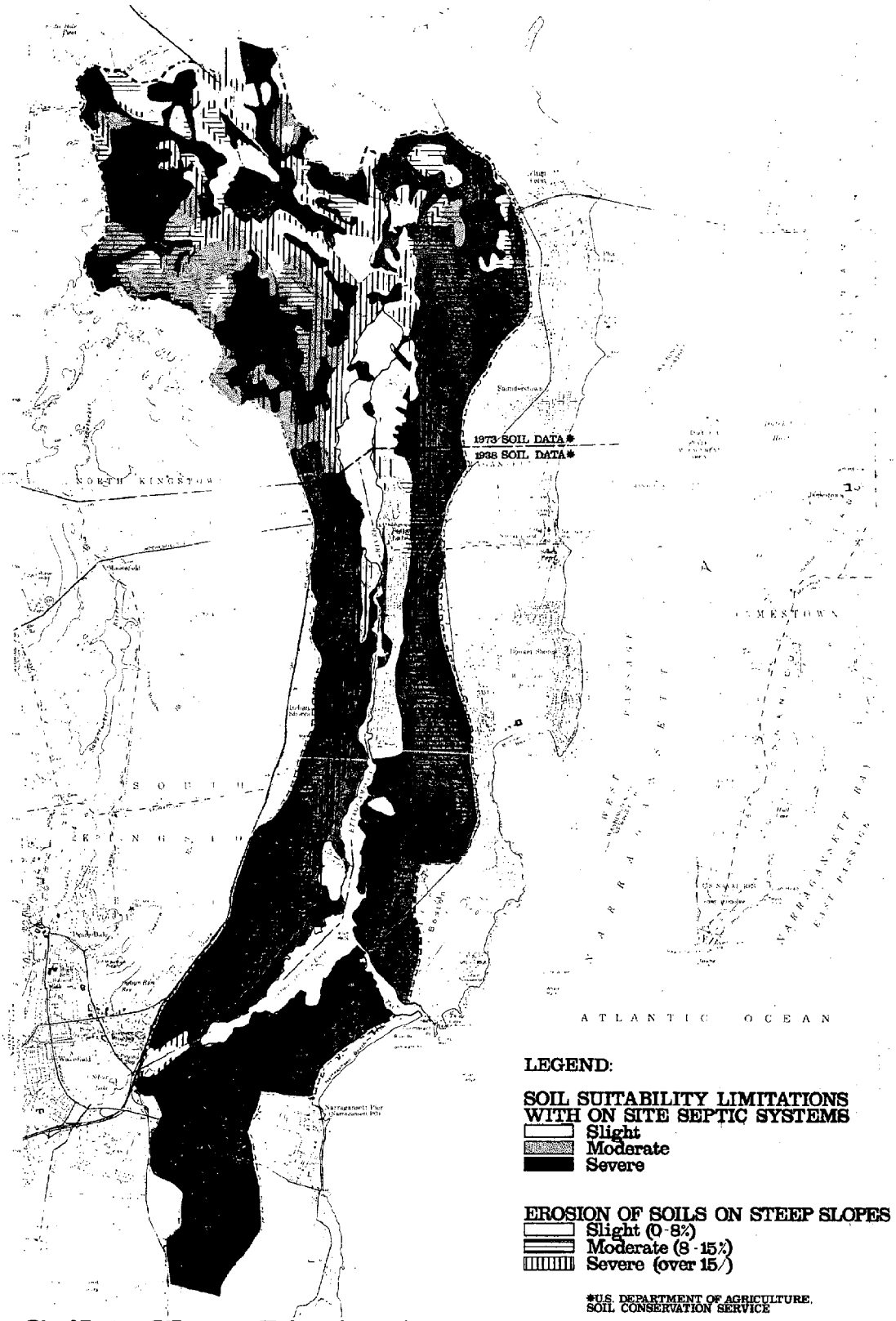

Soil & Slope Limitations

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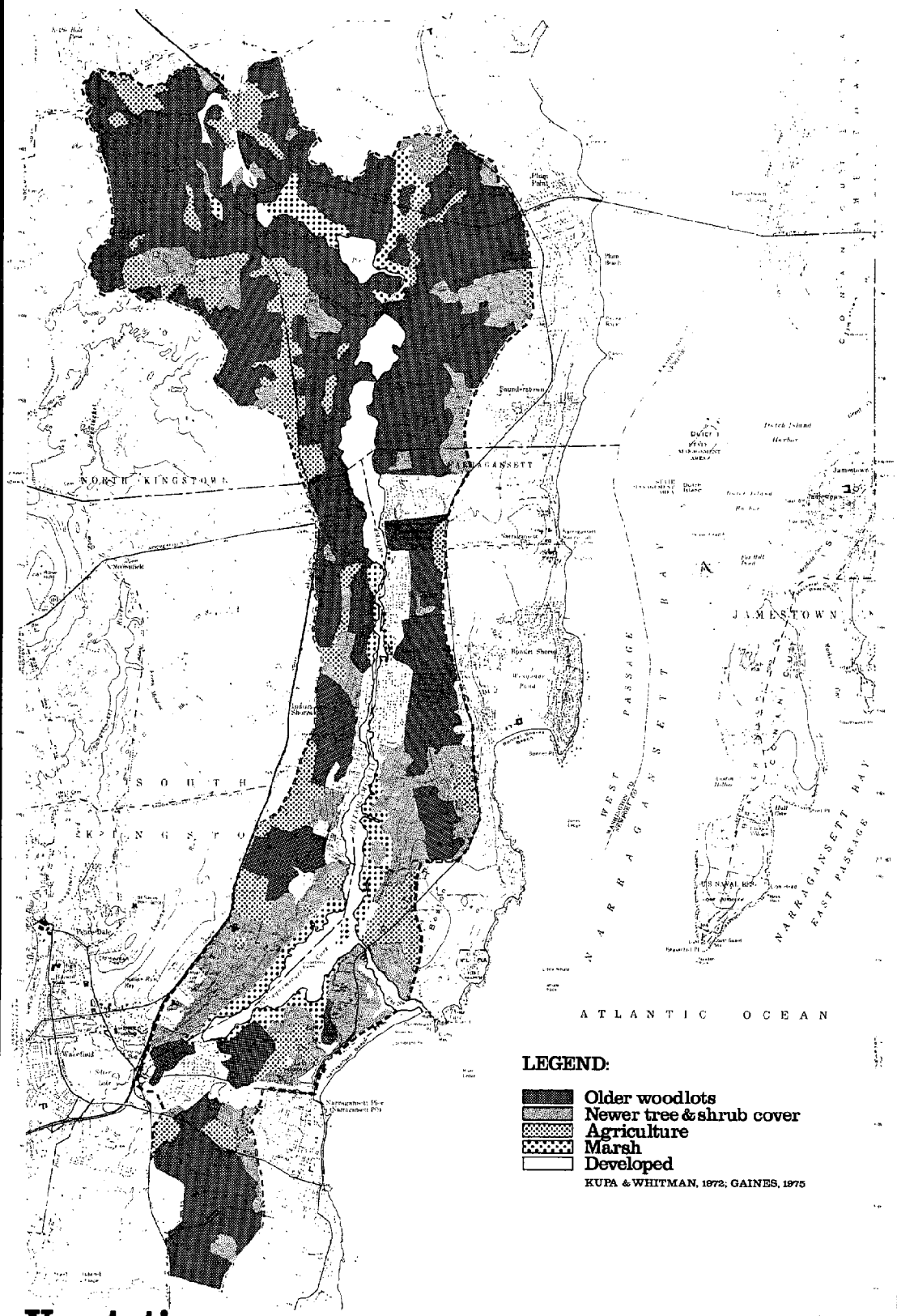

Vegetation

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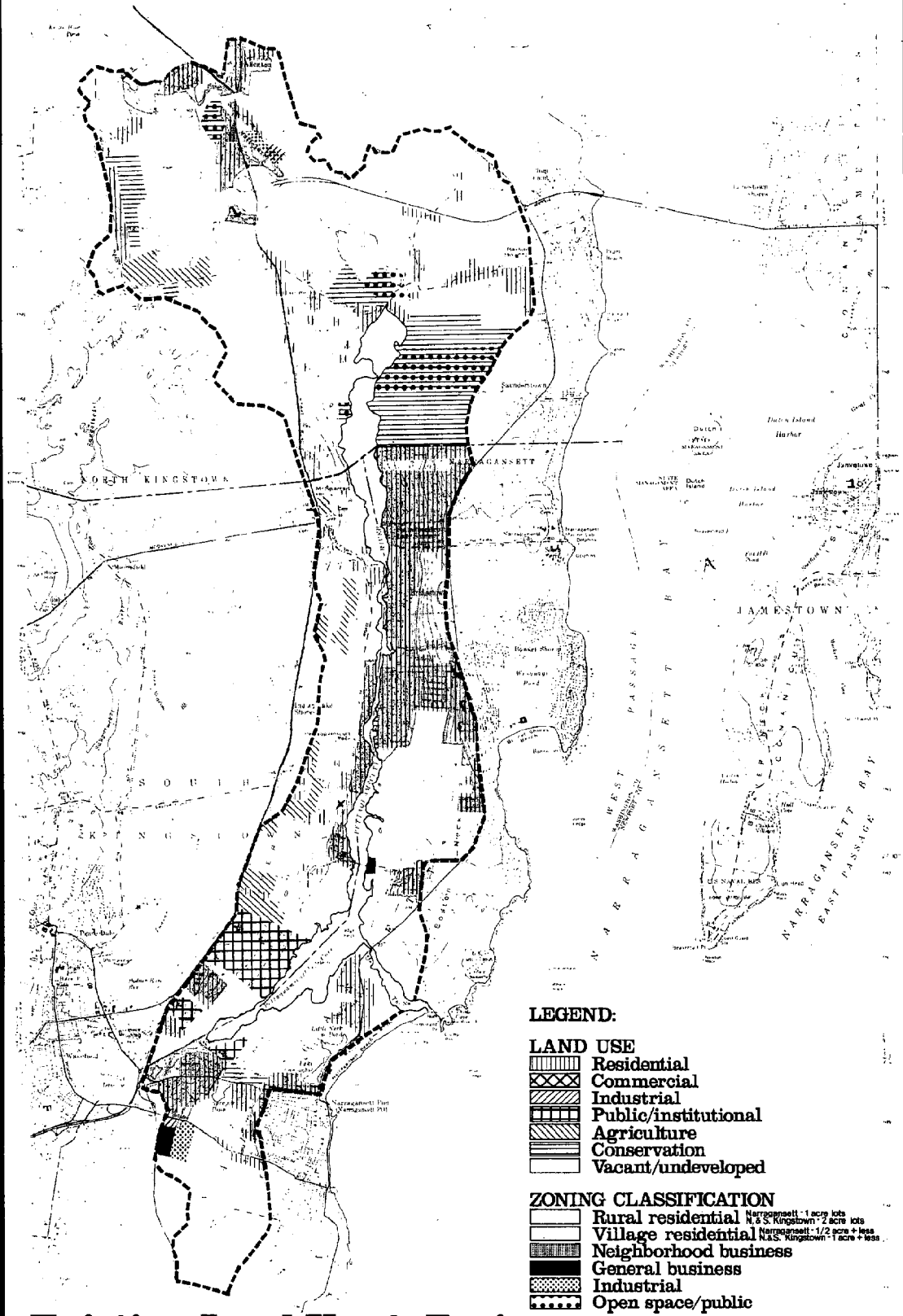

Existing Land Use & Zoning

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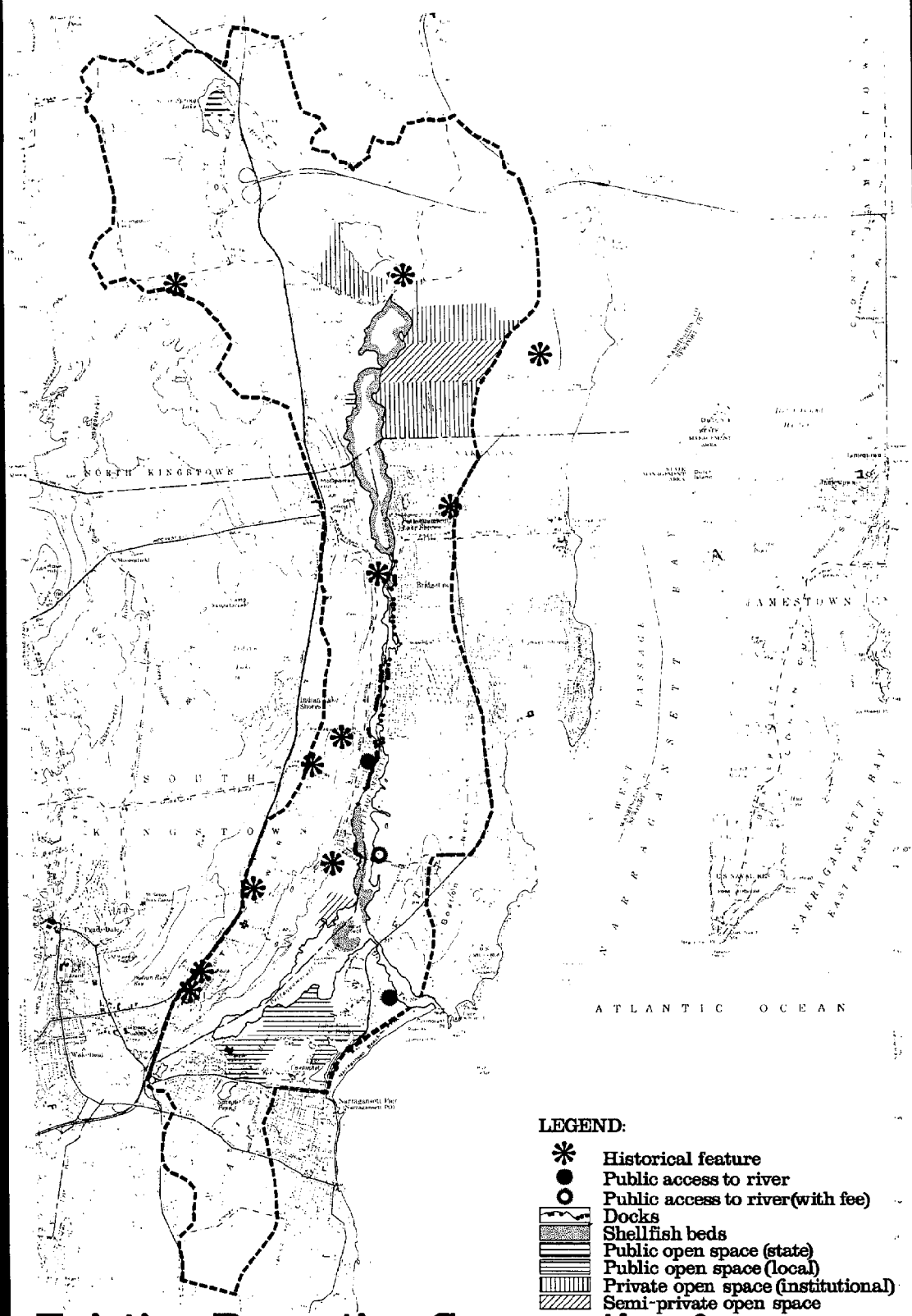

Existing Recreation, Conservation & Historic Use

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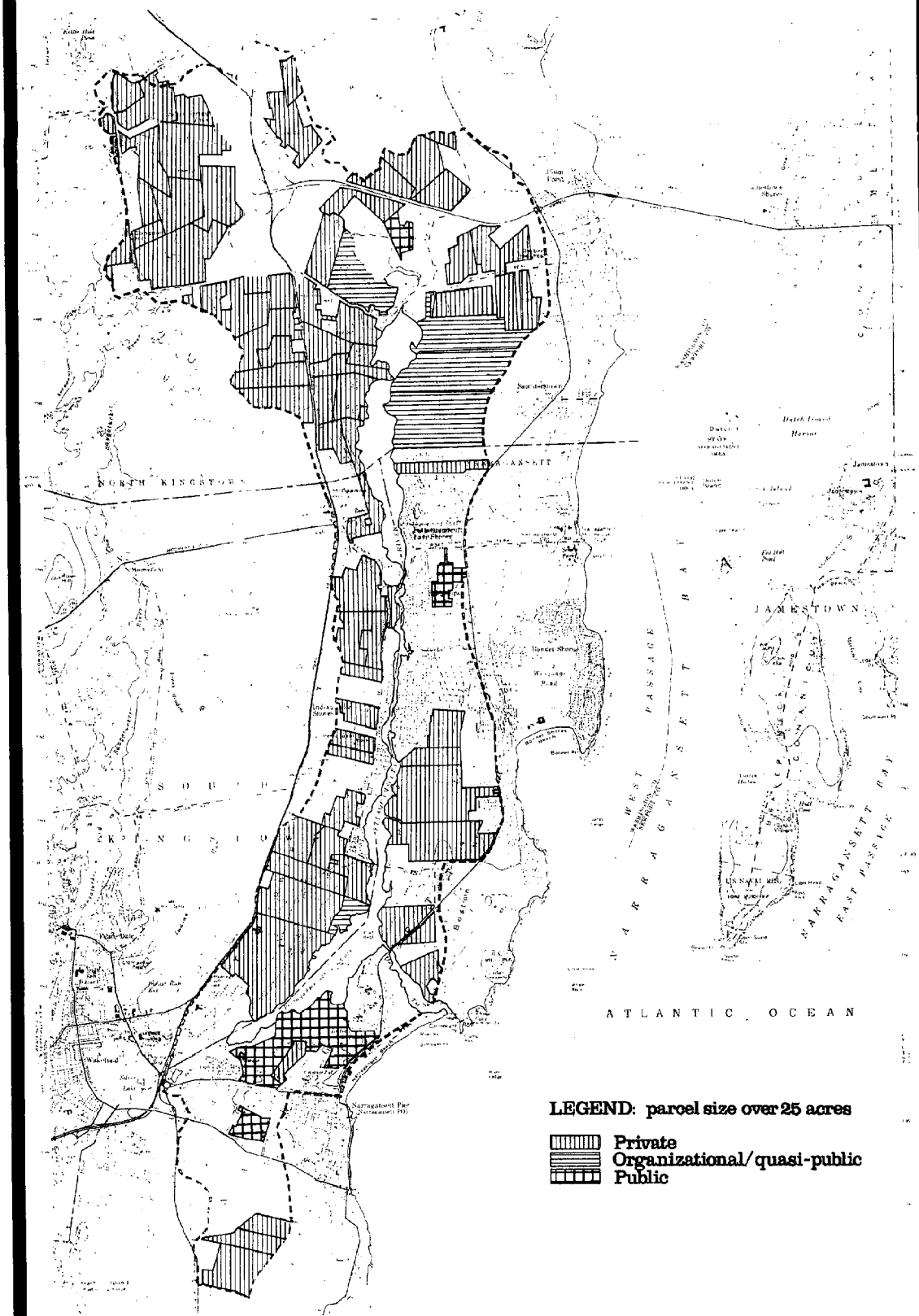

Existing Large Parcel Ownership

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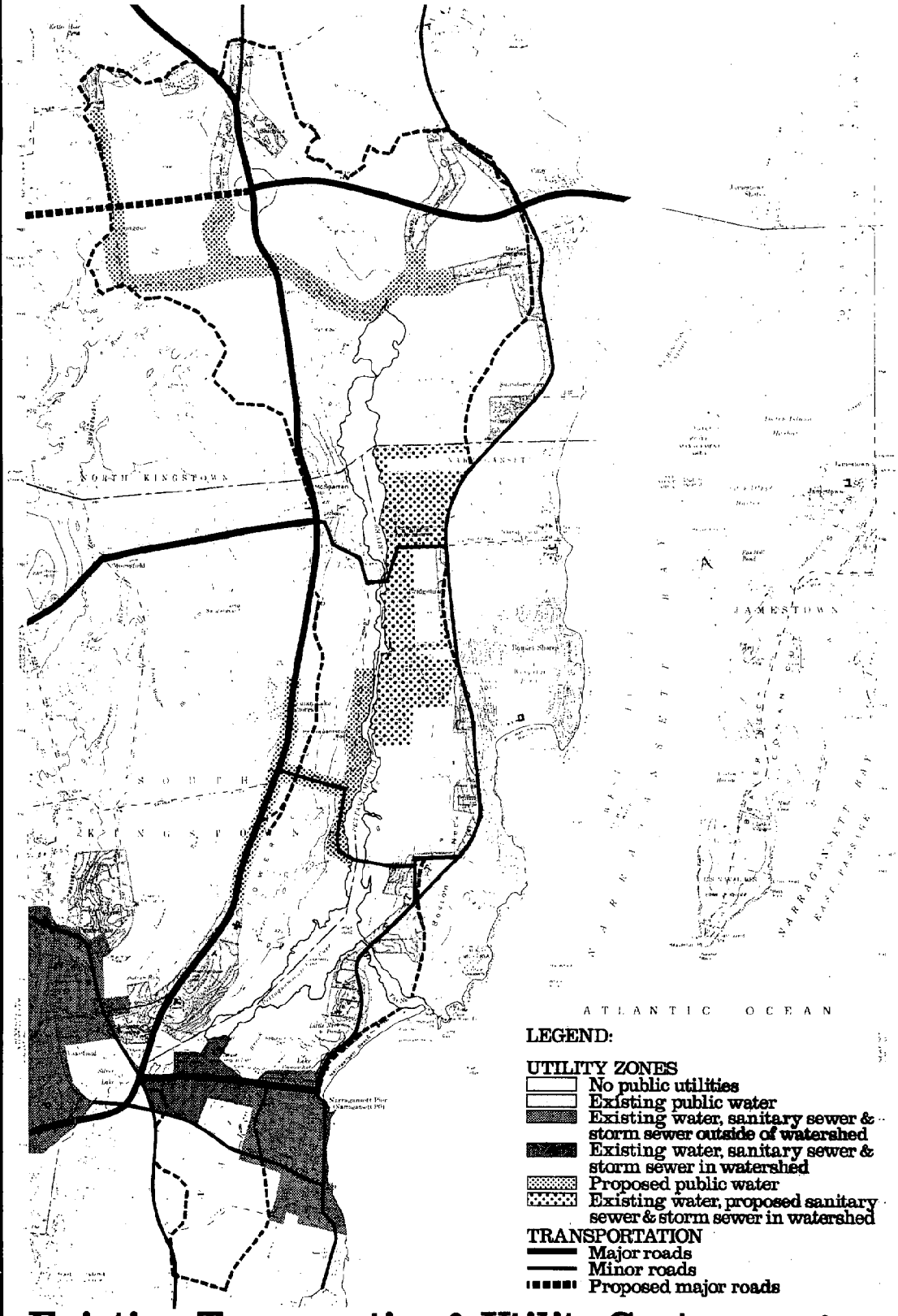

Existing Transportion & Utility Systems

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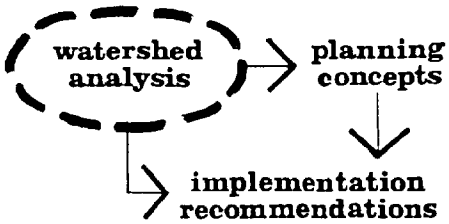


watershed analysis

introduction

The Narrow River, draining 14 square miles in South Kingstown, North Kingstown, and Narragansett, is located in the heart of the Southern Rhode Island region, one of the fastest-growing areas in the state (Map 1). Between 1950 and 1970, the population of the three towns increased by 212% (Narragansett), 101% (North Kingstown), and 66% (South Kingstown). The watershed itself, though, has not experienced the brunt of development to date, that has taken place in the bay shore areas and on the more easily buildable lands of the three towns. Except for a number of relatively small subdivisions and older communities, the lands of the Narrow River valley are predominantly undeveloped, a rural "wedge" between the more intensively settled areas on the east and south.

The region has proven highly attractive for commuter residential use and for coastal recreation and tourism. Some industrial development has also taken place, and energy-related facilities may be further developed in the future because of the region's highway and rail system and its

proximity to the coast. The watershed communities are attractive to a large degree because of nearby coastal recreational resources and existing community services. But, as a result of growth pressures in the region, the watershed may succumb to unplanned change to the extent that its attractiveness is lost and its ecological integrity is damaged.

The Narrow River is one of the several estuarine systems tributary to Narragansett Bay and Block Island Sound on the coast of Rhode Island. The relationship of varying geological and hydrological conditions has created a great visual and ecological diversity. Feastures of unusual interest include the broad and shallow cove bordered by extensive tidal wetlands, the slow-moving, narrow middle river stretches, and the 40'-60' deep upper ponds with their unusual anoxic (oxygen-low or oxygen-lacking) bottom conditions and chemical characteristics. The watershed can therefore serve a significant regional role if it is managed carefully as an area of special natural values -- with economic as well as aesthetic, recreational, and ecological benefits -- and can offset the intensive growth patterns that are inevitable in surrounding areas.

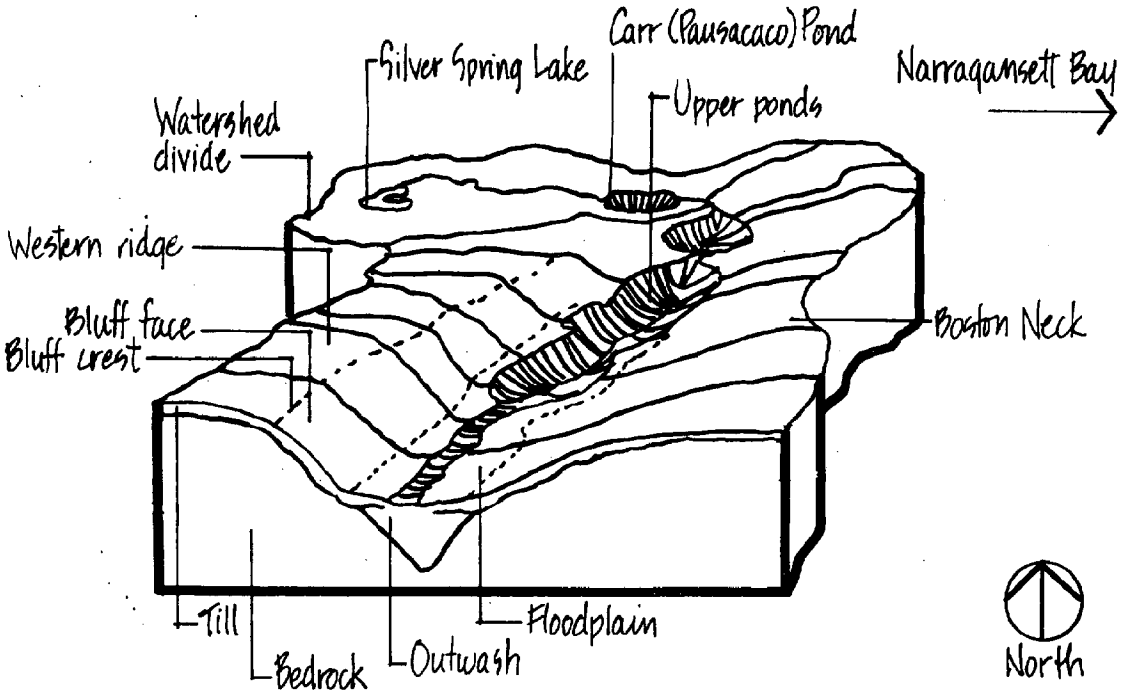
the natural environment

THE ESTUARINE SYSTEM

Physiographic and geologic features

The physical form of the Narrow River watershed was created by geologic and glacial processes primarily during the Tertiary and Pleistocene Periods. The pre-glacial bedrock valley underlying much of the watershed is best seen today in the Tower Hill Ridgeline and in bedrock outcroppings such as Pettaquamscutt Rock and Gooseberry Island. Later glacial action deepened the valley and also deposited deep layers of outwash, eventually forming the northern and southern watershed divides. The varied topography and freshwater drainage system in the northern

watershed are results of glaciation, as are the upper ponds, in which ice blocks prevented the deposition of outwash and later melted to create the unusual depths in those ponds. In the southern watershed, as along much of the Block Island Sound coast of Rhode Island, glacial processes created the level coastal lowland area.



Simplified cut-away view of the Upper Narrow River watershed (not to scale) (after USGS, 1959)

As the sea rose and entered the valley at the Narrows, a salinity gradient (that is, a progressive dilution of salt water with fresh water) extended into the previously freshwater river from the mouth to the north end of the upper pond. The salinity gradient, general shallowness, and protected conditions resulting from geological and hydrological processes enabled the development of tidal wetlands and a diverse biota typical of the region's estuarine systems.

Hydrology

The Narrow or Pettaquamscutt River is approximately six and one-half miles long from the mouth to the north end of the upper ponds. The major tributary to the Narrow River is the Mattatuxet River, originating in Silver Spring Lake and entering the river from the north, while other smaller streams feed into the Narrow River from southern and western watershed areas. Over the length of the Narrow River, high tides range from twenty inches and fifteen inches at spring and neap tide, respectively, at Sprague Bridge, to five inches and three inches at the north end of the upper ponds (Gaines, 1975a) (Map 3). Salinities show a similar decrease as the tidal effects lessen and as freshwater inflow from the Mattatuxet River and other watershed areas dilutes the sea water. At the mouth of the river, the salinity is 31.5 parts per thousand (ppt); at the top of the upper pond, it is less than 15 ppt (Hicks, 1958). The residence time -- the time required for the water volume of a river segment to be replaced by tidal and freshwater inflow -- also varies by distance from the river mouth. For the Narrows, the residence time is less than one day, for the Cove -- a few days, for the middle river area -- days to weeks, and for the upper ponds -- total residence time may be measured in years (Gaines, 1975b).

The upper ponds have a number of unique physical and hydrologic features that are due to their forty to sixty foot depths. Although most of the Narrow River is too shallow for stratification or layering of salt and fresh water, salinity differentials by depth are apparent in the upper ponds, particularly in the summer. The ponds act as nutrient sinks -- the anoxic conditions at the greater depths prevent normal use of or deterioration of the nutrients. In some years, climatic conditions may act to reduce stratification, by creating a turnover of the ponds and releasing nutrients as well as hydrogen sulfide -- a cause of bad odor -- from the deeper layers (Horton, 1958).

Tidal flows also affect the patterns of sand and silt deposition in the river. The average four foot depths in the river and two foot depths in the Cove (mean low water) appear to be fairly stable over time. However, particularly at the mouth of the river, dynamic but apparently short term changes do occur. The river bottom has obviously shoaled since its original glacial formation, but an equilibrium between accretion and erosion may now exist (Gaines, 1975a; Lambiase, 1972). Sprague Bridge and Middlebridge Bridge affect depths to the extent that they restrict flood flows, creating scoured depths under the bridges and shoaling of the scoured materials in the quieter waters beyond them.

Dredging

The shallow depths north of Middlebridge Bridge and at the river mouth have caused damage to boat propellors and prevented boat passage in low tide periods. A number of dredging proposals have been conceived to solve this problem, including the 1969 Corps of Engineers proposal for large-scale dredging from the mouth to the upper ponds, and a Rhode Island Department of Natural Resources proposal for more limited but continuous channel deepening. Although extensive dredging could provide navigation benefits to power boaters, valid arguments have been raised concerning the adverse environmental impacts resulting from dredging and the probable change in the scale, size, and nature of boating and boats on the river. Considerable negative public comment on large-scale dredging has been voiced in the past.

One possible solution to the shoaling problems is spot maintenance dredging of the channel and reconstruction of Middlebridge Bridge to facilitate tidal flow and diminish or eliminate shoaling caused by the existing causeway. This would appear to be a desirable alternative to the more extensive and environmentally problematic dredging programs, but before any decision is made on this or any other proposal, a thorough assessment of environmental impact should be prepared. Care should also be taken, in the event this limited alternative is adopted, to avoid utilizing bridge reconstruction as an element in increasing the traffic capacity of the east-west road linkage between Routes 1 and 1A. An increase in traffic capacity would in turn have adverse impacts on the natural and community environment of the valley.

Questions that should be carefully considered relative to the impact of any dredging and bridge reconstruction program would include the frequency, extent, and cost of maintenance dredging required to keep the channel open to a specified depth, particularly at the dynamic river mouth.

Shellfish bed and river bottom disturbance, turbidity and resedimentation, changes in the volume and rate of tidal flow resulting from either channel deepening or bridge reconstruction, and the effects of these changes on factors such as salinity and on organisms such as oysters which are sensitive to salinity changes would need to be assessed. The location and environmental impacts associated with a disposal area for the dredged material also need to be identified.

Changes in the character or extent of boating on the river resulting from facilitated passage, the implications of increased boat use for shoreline development or boater satisfaction, and the monetary and

and environmental costs and benefits of dredging or bridge reconstruction need to be identified and weighed.

Except for the changes affected by the bridges, the salinities, tidal flow, and depositional patterns of the river are apparently natural conditions resulting from the physical configuration of the river valley and its location with respect to the Bay. Significant changes in flow patterns or salinities would have serious consequences for the estuarine system, particularly for the wetlands and aquatic biota that are dependent on them.

Tidal wetlands

The shallowness, favorable salinities, and protected conditions of the Narrow River have made possible the growth of approximately 250 acres of salt marsh. Occurring mostly in the lower river area, these marshes are comprised of species such as saltmarsh cordgrass (Spartina alterniflora), saltmarsh meadowgrass (S. patens), black rush, eelgrass, and common three-square bulrush. Tidal wetlands function in the estuarine system to provide organic matter, largely through the decay of marsh vegetation, which gives sustenance to the microscopic plankton, which in turn serve as food, through the links of the estuarine food web, for finfish, shellfish, waterfowl and other estuarine and coastal life forms. Tidal wetlands also provide habitat and shelter for waterfowl and other wildlife and nursery areas for the young of aquatic species. They filter, store, and slowly release nutrients from upland areas. They also stabilize bottom sediments which can be detrimental to finfish and shellfish productivity if allowed to become suspended through erosive action.

Although marsh destruction is becoming a major concern among coastal states, it appears that the tidal wetlands on the Narrow River have remained largely intact. Through the acquisition program of the Audubon Society of Rhode Island, tidal wetlands in the southern watershed have been protected (Map 7). Local governments and the Rhode Island Coastal Resources Management Council (CRMC) regulate filling, dredging, discharges into, and other alterations to tidal wetlands through zoning ordinances and permit programs. However, the discharge of runoff from storm water drainange systems directly into tidal wetlands and incremental filling and dredging projects that have been allowed in the past will, if continued over time, result in the incremental loss of an invaluable estuarine resource.

Biotic resources

The shellfish of the Narrow River are, according to species, dependent on and distributed according to salinities, bottom sediments, and other hydrologic factors suited to the species. Quahaugs, mussels, and clams are primarily found from near the Cove delta to north of Middlebridge Bridge. Oysters are found in the shallower near-shore hard bottom areas in the upper ponds. Blue crabs migrate through most of the river, although with large fluctuations in numbers. A 1958 study of shellfish conditions on the Narrow River reported over-exploitation of quahaugs and clams (Division of Fish and Game and Narragansett Marine Laboratory, 1958). The Department of Natural Resources subsequently reduced daily catch limits for most shellfish on the Narrow River.

The Narrow River functions as a spawning, nursery, and over-wintering area for a high diversity of finfish species: alewife, winter flounder, bluefish, white perch, striped bass, and numerous other small fish. The spring alewife runs on the Narrow River are reported to be the best in Rhode Island. An estimated one million entered the mouth in 1959; of these, eighty percent were netted by commercial and recreational fishermen (Cooper, 1961). During public presentation of the preliminary findings of this Plan report, residents expressed concern over decreases in shellfish and finfish numbers and species. Recreational and commercial over-harvesting or adverse changes in hydrological parameters may result in decreases in the numbers or diversity of finfish and shellfish species in the Narrow River, but without a management program and continued resource monitoring, no full resolution of this question can be achieved.

A recent summer count of birds in a lower river wetland showed a comparatively high diversity of species, including herons, swans, ducks, hawks, gulls, terns, king fishes, swallows, and sparrows (Oviatt et al., 1975). Many of these species nest or rest in the upland areas while feeding on the adjacent wetlands. In addition, one may find a wide variety of migratory waterfowl: green-winged teals, mallards, black ducks, and Canadian geese (Wright, 1949). Although local residents report an increase in waterfowl numbers over time, the destruction or adverse alteration of either upland or wetland habitats would result in a decrease in the numbers or species of waterfowl that they support.

Water quality

The quality of water significantly affects the health and productivity of an estuary. The narrowness and shallowness of the Narrow River , the long residence times of tidal flow, and the steep

ledge bedrock valley indicate that the Narrow River is easily susceptible to pollution under uncontrolled conditions. The quality of freshwater inflows, strongly influenced by the nature and extent of upland development, is a major factor in the quality of water in the river itself.

The Narrow River is currently classified by the Rhode Island Department of Health as "SA": "suitable for all sea water uses including shellfish harvesting for direct human consumption..., bathing, and other water contact sports" (R.I. Department of Health, 1973). However, recent studies and observations by residents indicate that the quality of the water is decreasing. A study by Repasz and Hargraves (1974) showed that the coliform standards for SA waters were uniformly exceeded throughout the summer along the entire length of the Narrow River. Although the sources of the high coliform counts as well as other pollution indicators have not been pinpointed and in fact may be of natural origin, there are several possible reasons for a decrease in water quality due to upland development.

The installation of on-site septic systems requires a permit from the State Department of Health showing the capability of the soils to adequately filter sewage effluents. However, groundwater and river pollution from septic systems may still occur if the systems are old or inadequately maintained. In the Rio Vista neighborhood on the east bank of the Narrow River, evidence suggests that septic system effluents have been filtering into the storm drainage systems and subsequently discharging into the river. The impermeable bedrock ledge underlying the valley may act to direct partially-filtered effluents into the river. In addition, although a septic system may function adequately on an individual lot, the effluent from an aggregated number of systems may exceed the "saturation" level of an area.

Untreated or partially filtered sewage can cause algal blooms and oxygen deficiency in a water body, may be stored and concentrated in shellfish, and may harbor disease-carrying organisms. If further septic system development occurs without consideration of the relationship of such systems to drainage systems, water bodies, and the geological structure of the watershed, a decrease in water quality in the Narrow River and adverse impacts on the aquatic resources will undoubtedly result.

Pollution from urban runoff has not been identified as a major existing problem in the Narrow River. However, because urban runoff carries automotive wastes, nutrients, sediments, organic wastes and fecal bacteria, and may, for certain parameters, be comparable in impact to raw sewage discharges (Tafuri, 1975), control of urban runoff should be a major planning consideration as the watershed develops.

In existing higher density residential areas such as Rio Vista, Pettaquamscutt Shores, and other subdivisions along the Narrow River, storm water runoff is discharged into the river from drainage pipe outfalls. Large discharges of storm runoff into a tidal wetland can decrease the salinity and eventually alter the grass species. The use of piped drainage systems to handle storm runoff prevents the settling out or filtering of solids. The development of existing drainage systems on a subdivision-by subdivision basis increases the cost of providing cost-efficient runoff treatment systems as they are required. Continuing to permit direct discharges of untreated urban runoff into the Narrow River may eventually result in a decrease in water quality and in the value of the aquatic resources of the river.

A third problem which is now marginal but which may become aggravated over time, is that of sediment discharge from cleared upland areas into the Narrow River. Excessive erosion resulting from land clearance and other construction practices can cause sedimentation and smothering of eggs and young of certain bottom organisms. Sedimentation and related turbidity can reduce light penetration in a water body. Particularly on the steeper slopes adjacent to the Narrow River, uncontrolled development may result in a decrease in water quality through sedimentation.

THE UPLAND ENVIRONMENT

Natural drainage system

The problems of septic system and urban runoff pollution and soil erosion and sedimentation may originate in distant watershed reaches. These same problems may affect the independent resource values of the upland areas as well: its wildlife, aesthetic quality, and recreational potential.

Particularly in the upper watershed, a well-developed natural drainage system of swales, ponds, streams, wetlands, woodlands, and lakes exists (Maps 2,5). The wetlands and vegetated uplands function to absorb and transmit storm runoff to groundwater systems, to slow the velocity of runoff and its erosive effects, and to filter silt, sediment, and other pollutants from storm runoff. Increases in such flows resulting from clearing of vegetation or filling of wetlands will

cause streambank erosion and flooding.

The Mattatuxet River (the upper reach of the Narrow River) is classified by the State Department of Health as "B" above Pausacaco or Carr Pond, and "A" below that pond. Class A waters are "suitable for water supply and all other water uses; character uniformly excellent." Class B waters are suitable for all uses, including public water supply with appropriate treatment, but have lower standards than Class A water for certain parameters (Rhode Island Department of Health, 1973). The good water quality of the streams is at least partially the result of the low densities of development and the large extent of preserved woodlands in the upper watershed. In addition, the Department of Health enforces the water quality standards, primarily through permits for on-site septic systems and control of large point sources of pollution: industries, sewage plants, sand and gravel operations. The Department of Natural Resources, through the Fresh Water Wetlands Act, also regulates the discharges into streams and most other natural drainage system elements, as well as any alterations affecting these resources.

While there do not appear to be significant pollution or alteration problems in the upland drainage system, reductions in vegetative cover or filling, dredging, or altering of wetlands may result in long term reductions in water quality.

Soils and slopes

The physical and chemical characteristics of a soil type determine its suitability for community development, agriculture, timber production, and all other uses of the land. The United States Department of Agriculture Soil Conservation Service (SCS) has developed a detailed soils interpretation system in Rhode Island which evaluates the suitability of various soil types in the state. (Although recent soils maps exist for North Kingstown, soils data for Narragansett and South Kingstown date back to 1939 and are not as well detailed as the later efforts.)

Within the watershed, soils have only moderate productivity as timber land. There are some areas with Class I agricultural soils along the ridgelines and in the northwest watershed. However, while the continuation of existing agricultural uses should be encouraged, neither agriculture nor timber use are extensive at the present time.

The suitability of the soils for community development is indicative of the physical possibility of constructing effective septic systems, of the cost of construction and maintenance of buildings with basements

and road systems, of the ease of establishing vegetation, and of the cost and feasibility of site preparation. The soil characteristics and classifications developed by the SCS to evaluate soil suitabilities for community development are shown on the following table.

SOIL SUITABILITIES CLASSIFICATION CRITERIA (Refer also to Map 4.)

limitations for community development with public sewer

	depth to water table	depth to bedrock	percolation rate	stoniness	muck, flooding
slight	>1.5'	> 4'	N.A.	not stony	
moderate	1.5 - .5'	2 - 4'	N.A.	very stony	
severe or very severe	< .5'	< 2'	N.A.	extremely stony	X

limitations for community development with on-site septic systems

slight	>4'	> 4'	fast	not stony	
moderate	.5 - 4'	2 - 4'	moderate (>6" per hr.)	very stony	
severe or very severe	<.5'	<2'	slow (<2" per hour) or fragipan	extremely stony	X

from (USDA, 1974)

The SCS classification system also addresses slope considerations, with soils of 8 percent slope having slight, 8-15 percent, moderate, and 15 percent, severe limitations for community development. The steeper the slope, the greater the potential for soil loss from cleared areas, productivity loss through topsoil erosion, sedimentation of adjacent wetlands and water bodies, and construction-related problems of slipping and gullying.

In more detailed soils analyses, slopes (steepness and length) interact with soils (texture) to produce variable erosion potential values. A certain percent of the soil eroded from an area will eventually be deposited in the streams or ponds. Thus, the clearing of an area during construction will result in adverse impacts on water quality, depending on the soil, slope, and their location with respect to water bodies. In general, the higher the erodibility of a soil, the

longer and steeper the slope, and the shorter the distance to a water body, the greater the impact.

Within the watershed, a pattern of severe and moderate limitations for community development based on soil and slope characteristics emerges (Map 4). The possibility of residential development in these areas poses potential problems in terms of individual development costs, public service provision costs, and other environmental costs. In the northern watershed and along the western ridgeline, the existing 2-acre residential zoning reflects the physical constraints to development in these areas. However, even low density residential use, particularly if it is not adequately controlled to mitigate against adverse environmental impact, can result in a costly and undesirable pattern of development.

Vegetation

The older (second growth) woodland vegetation in the watershed is typical of the oak/mixed hardwood vegetation of the region, reflecting generally sandy soils and a history of forest fires in the eastern watershed. Forty-eight percent of the watershed, primarily in the north, is covered by this type of vegetation (Map 5). Newer second growth shrub and tree cover (eastern red-cedar, cherry, dogwood, aspen, birch) comprising 30 percent of watershed land cover, is more typically found on abandoned farmland, primarily in the lower watershed. A third category of vegetation includes trees such as red maple, grasses such as the spartina species, sedges, and other wetland species that are found along streams, in marshes, bogs, swamps, and in other areas of high groundwater conditions (Kupa and Whitman, 1972; Gaines, 1975a).

Wildlife and fish

Freshwater fish in the watershed include chain pickerel, largemouth bass, sunfish, bluegill, and yellow perch. The anadromous alewife spawns in Carr Pond, and the state stocks Silver Spring Lake with brook, brown, and rainbow trout (Saila and Horton, 1957).

A variety of wildlife species are supported by the wetland, open field, and woodland habitats of the watershed. Although no known studies have been made of numbers or species, the following have been sighted in the area: ducks, herons, bobwhite quail, snowy egrets, ospreys, meadowlarks, field sparrows, rabbits, raccoons, foxes, woodchucks, woodcocks, woodpeckers, and deer (U.S. Department of Agriculture). Although certain wildlife species will increase in number as an area suburbanizes, most will decline as a result of the habitat destruction and disturbance resulting from development.

the aesthetic environment

Aesthetic resources are the visual or sensory attributes of a landscape, and have a value distinct from that of the practical utility or ecological functions of the resources. The form and color of the watershed's woodlands, for example, have importance beyond the value of the woods for timber (negligible today) or for ecological roles (ranging from modest to significant). The protection of aesthetic resources in the watershed--both natural and built--would reinforce the wise management of biological, ecological, and cultural resources and would maintain and enhance the quality of community life. Management of the environment for its aesthetic attributes is a valid concern.[1]

THE NATURAL ENVIRONMENT

Viewsheds

In the Narrow River watershed, much of the beauty of the landscape is created by the predominance of basic natural elements: water, woodlands, hills, and wetlands. Most of these elements are easily associated within viewsheds, that is, units of the landscape that are partly enclosed by ridgelines or other topographic features (Map 10), and are thus easily seen by an observer from central points.

Pettaquamscutt Cove is characterized by expansive views of open water, tidal wetlands, and the dominant western wooded ridgeline.

[1] See Reading List and Contacts: No 1.

Of the entire watershed, the Narrows exhibits perhaps the most exciting diversity of aesthetic resources: the rocky headland, wetlands, wooded hills, beach formation, and the interface between the river and the bay.

As the river narrows in the middle river area, the shoreline development along it becomes increasingly dominant. However, the fringe marshes and wooded ridgeline function to maintain a natural character in this area.

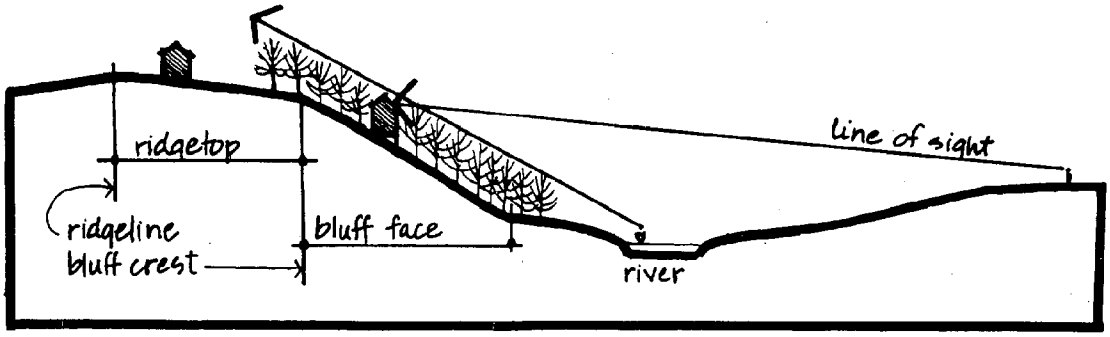
The aesthetic resources of the upper ponds are simple: open water and steep, wooded, shoreland slopes.

The aesthetic resources of the upper watershed are highly variable, due to the diversity of glaciated topographic forms and land cover types: agriculture, woodland, and wetland.

Dominant aesthetic resources and view clusters

Among the viewsheds, specific aesthetic resources or view clusters stand out as particularly important in establishing the natural character of the aesthetic environment: the ridge, the floodplain, upland edges of wetlands, water/land edges, and the woodlands. The ability of these resources to absorb or accommodate various uses or development and still retain their aesthetic value will guide us as to the degree of management needed to avoid losses of natural aesthetic quality in the watershed.

Because the western ridge is dominant, development on it is potentially at odds with its landscape value. From the river and opposing hillsides, the bluff crest defines the visual horizon. The continuity of the tree line along the crest maintains the natural character of the horizon line and also screens development of the ridge top from valley



Western ridge

viewers. Because existing structures on the bluff face are widely-spaced, sited within the tree canopy, and do not significantly protrude above the tree line, they do not detract from the natural quality of the river landscape. However, additional development over time could destroy the aesthetic continuity and integrity of the bluff area.

The edges between water and land and wetlands and land form lines of high visual contrast. Because these edges are often the focal points of views, development along them can be highly evident and distracting. Siting buildings well back from these edges and maintaining existing vegetation, as has been done around the upper ponds, serves to maintain the visual continuity of the edge.

The coastal floodplain extends through the middle river area. Its strongest aesthetic quality is its relative flatness which, together with mixed vegetation and open areas, creates desirable viewing points along the river. Recreation opportunities are also provided because of ease of access and the presence of activity space along the flat shore.

Although the woodland species of the watershed are typical of the overall region, the extensiveness of wooded cover in the watershed is a valuable and increasingly uncommon aesthetic resource in the built-up coastal edge of Narragansett Bay. A limited amount of development can be accommodated in the woodlands because of the visual buffer created by the tree canopies. However, the steeper the slope, the greater the area open to view, and the more damaging clear-cutting and even selective tree removal becomes. Even low density residential development will distrupt the continuity and density of woodlands and, eventually, the natural watershed character.

Without adequate control of watershed development, aesthetic distinction and diversity and the scenic, recreational, and community benefits deriving from them risk being destroyed.

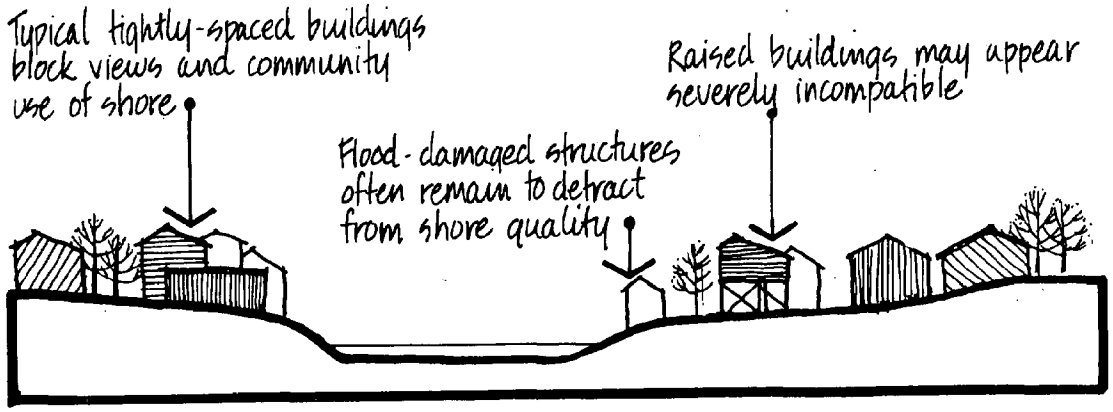
THE BUILT ENVIRONMENT

Community development

Just as the hills, water, woodlands, and other resources of the Narrow River watershed can be described in terms of their aesthetic attributes, so can elements in the built environment. Narragansett Pier, Wakefield, Wickford, Saunderstown, and others are discrete, identifiable townscapes, some with more pleasing, some with less pleasing aesthetic qualities.

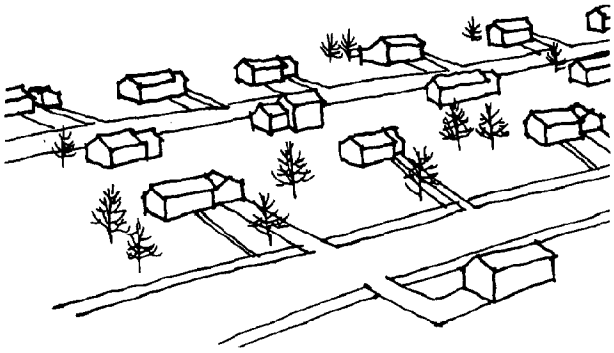
As an element in the landscape, a town is distinguished by its visual contrast with the surrounding natural environment. Sprawling development in outlying town areas destroys the visual crispness between town and non-town, and, if uncontrolled in the watershed, could destroy the positive aesthetic quality of existing town development.

Falling between town and rural development is suburban development, which, in many instances, neither exhibits the aesthetic attributes of towns nor maintains the natural quality of the rural environment. Particularly in the middle river area, the pattern of shoreline development detracts from the natural aesthetic quality of the river without contributing its own potentially compatible and aesthetic character to the river landscape. While the scale (height, size) of the houses is appropriate, the spacing of them with respect to each other and to the river results in a tattered, scattered, suburban landscape. The multitude of shoreline edge treatments -- rip-rap, wood, concrete -- also acts to disrupt the continuity of the water/land edge.

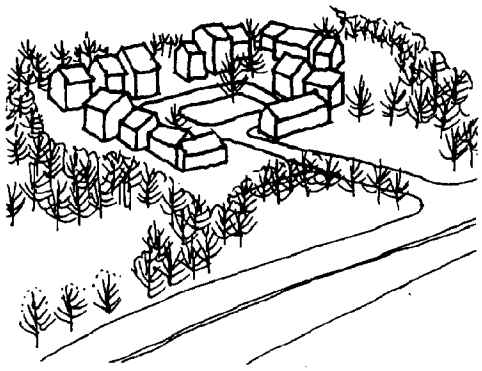


Floodplain development

An alternative to typical suburban patterns, and one that serves to break away from undifferentiated quality, is clustered housing. Through clustering, the potential exists to preserve existing natural aesthetic resources on the site within the community open space areas. If clustered housing or a similar pattern is not encouraged as an alternative type of development within the watershed, the opportunity to preserve natural aesthetic resources and to enhance the aesthetic quality of community life may be lost.



Typical suburban subdivision

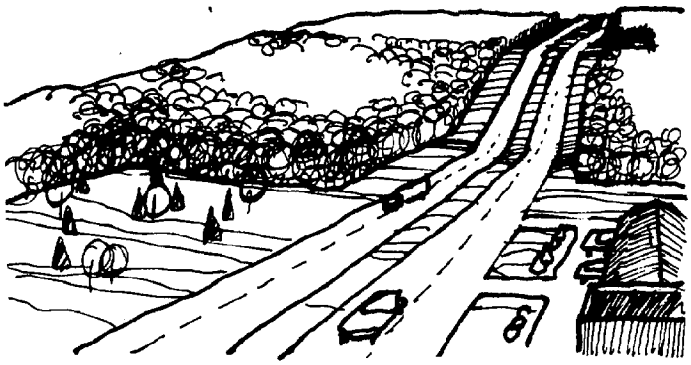


One type of cluster development

Road corridors

Many of the public views of the river and watershed occur from the road. The impression a traveler gets of the aesthetic quality of the area will often depend on the aesthetic quality of the road corridor. The most-traveled roads in the watershed present a variety of aesthetic resources.

Running along the coast, Route 1A (Boston Neck Road) has areas of high scenic quality characterized by roadside hedgerows or tree rows, large estate setbacks, and bay vistas. It runs past the cultural and aesthetic resources of the Casey Farm, Saunderstown, and Narragansett Pier, but also past areas of extensive and detracting strip development.



Because Route 1 (Tower Hill Road) runs along the ridge-line, the views from it are expansive and reveal large-scale landscapes of woodlands and fields.

From Route 1, Bridgetown Road has a scenic descent into the valley. However, the pattern of residential development near the bridge detracts from the river views.

Other areas of scenic quality, such as Middlebridge Road, parallel the river, with roadside woodlands and large housing setbacks. As with Bridgetown Road, the pattern of residential and commercial development near Middlebridge Bridge detracts from river views.

A narrow and winding country road, Gilbert Stuart Road has areas of high scenic quality, with stone walls and near-road woodlands, partially-concealed residences, and the Gilbert Stuart birthplace. Scrub growth, however, hides most of the walls, as well as important views of the Upper Pond and the Stuart birthplace. If the verges were cleared to reveal the walls, an increase in scenic value could be achieved.

Travel is a sequential experience, revealing a series of natural and built aesthetic resources, and a spatial experience, as the route varies in degree of visual enclosure or openness. In guiding development to maintain and enhance the aesthetic aspects of travel, both the sequential and spatial characteristics of a road should be considered.

Vistas of the bay currently exist along Route 1A and represent an important element in the travel experience. However, development in the foreground of the vistas, unless sited off to the side and designed to be compatible with the view in terms of scale, materials, or colors could detract from the aesthetic quality of the vista. Similarly, further uncontrolled shoreline development on the Narrow River in the vicinity of the bridge crossings could detract from the aesthetic quality of the river vista. The proximity of Gilbert Stuart Road to the upper ponds represents a missed opportunity: a simple clearing of the existing dense underbrush between the road and the ponds would provide a scenic view of the river.

Another important spatial element is the enclosed view. Within the watershed, enclosed views are primarily created by roadway vegetation in the form of woodlands or hedgerows. The continuity of roadside vegetation and its function in screening views of detracting aesthetic character can be destroyed if uncontrolled development results in clearing of the vegetation for road access or during construction.

Since much of the existing woodland is recent cut-over growth, many road edges, stone walls, and fences are overgrown with scrub trees, shrubs, and tall grasses. A cutting and maintenance program to reveal a clear green verge and stone walls, supplemented by judicious planting of compact evergreen shrubs such as mountain laurel and azaleas, and of flowering vines, could improve the scenic value of many of the watershed's roads.

The aesthetic quality of a road sequence depends to a large degree on the distinctness of the aesthetic resources. Coming upon Saunderstown or Narragansett Pier is a pleasurable experience because the aesthetic quality of the towns contrasts with the preceding views of wooded and other natural areas. However, strip development such as occurs along Routes 1 and 1A creates an undifferentiated and detracting aesthetic character, due to the small building setbacks, the strip character of large expanses of parking areas, and the proliferation of non-uniform signs. On Route 1, the further development of scattered commercial services with their typical style of landscape treatment would be totally out of scale with the large woodland and open field areas.

Cluster development, which represents a potentially more aesthetic alternative to traditional subdivisions, can also enhance the aesthetic

quality of roadside residential and commercial development. Unless clustering is encouraged as a development pattern along a road corridor, in conjunction with active roadway maintenance and beautification programs and other regulations, the existing aesthetic quality and individual character of watershed roads will, over time, be eroded.

the cultural environment

LAND USE PATTERNS

Residential land use

The predominant land use in the watershed is residential, occurring at the highest densities (approximately one quarter acre lots) in South Kingstown and Narragansett in the middle river area and in Narragansett Pier (Map 6). Moderate density residential uses occur primarily along road corridors: Routes 1 and 1A, Gilbert Stuart Road, and Allentown Road. Existing residential land uses are zoned at existing densities, with undeveloped areas zoned for one and two acre minimum lots in Narragansett and North and South Kingstown, respectively.

Housing represents a valuable community resource, particularly when it provides a wide range of alternative living environments. However, when community development occurs in patterns of leap-frog land consumption and of suburban sprawl, social costs often result: higher costs and less efficiency in providing community services (roads, utilities, public institutions), loss of open space amenities, and loss of identifiable community character.[1]

Typically, urban development is seldom effectively controlled until sprawl and other undesired patterns emerge into full view. Within the watershed, a number of important controls exist, but even the zoning of two acre "rural residential" use in areas that are not suitable for development physically or in terms of service levels does not preclude future avoidable environmental and social costs.

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[1] See Reading Lists and Contacts: N° 2.

An ameliorative measure that answers some of the land-use problems of random development is clustered housing. By "clustering" housing--single-family, townhouse, or multi-family--while maintaining overall zoned densities, the opportunity exists to preserve community open space and to capitalize on construction and municipal service savings. In North Kingstown, clustered development is a special exception permitted use in zoned residential districts, while planned village districts, representing a similar concept at a larger scale, are mapped. Narragansett provides multiple-family residential development as a special exception in residential districts with gross densities as zoned, but without specifying a cluster principle or allowing for clustered single-family housing. In South Kingstown, no clustering provisions are included in the zoning ordinance.

The Rhode Island Farm, Forest, and Open Space Act (1968) enables preferential taxing of selected lands by local governments, and is used to a limited extent in the three watershed towns. Preferential taxing in general functions better to provide tax relief than it does as a means of guiding land use development. In areas where sprawl is likely to occur and where protection is most needed, preferential taxation does not usually provide an incentive large enough to compensate for loss of use flexibility (Gustafson and Wallace, 1975). The two-year tax rollback penalty of the Rhode Island act has been criticized by town government personnel as being too weak to effectively maintain open space lands.

Another more specific problem in the watershed is residential development in the floodplain. The towns have adopted regulations for land uses in the 14' $\pm$ 100 year coastal floodplain in order to qualify for HUD's flood insurance program. The regulations typically require floodproofing of new structures and elevation of the first floor above the floodplain, either by building on an earth platform or stilts. Flood hazards along the Narrow River may be sufficient to cause considerable damage. Raised platforms and stilts may prevent flood damage to a particular residence, but may also trap debris and create higher flood levels upstream. Platforms and stilts can also create aesthetic conflicts with adjacent home designs. The existing on-site septic systems along the river will also wash out during floods, polluting the river and creating potential health hazards. Continued development of the floodplain will ultimately result in public as well as private costs.

Commercial land use

Existing commercial uses occur in a few areas along Routes 1 and 1A; most are concentrated in Wakefield and Narragansett Pier. While town

zoning maps indicate no further commercial development in the watershed, the provision of highway-related or neighborhood commercial services may be justified in time. If future development is allowed to occur as a series of zoning exceptions, strip development will probably result. Strip development often causes a decrease in user convenience, road safety, and the aesthetic quality of the road corridor.

Clustering of commercial services in designated areas accessible to but set back from existing roadways can mitigate some of the adverse effects of strip development. In addition, if located adjacent to or within communities, clustered commercial and other services can function as a village center. Although a planned business district is delineated on North Kingstown's zoning map, none of the towns currently allow for or encourage clustering of neighborhood or highway-related services in their zoning ordinances.

Recreational uses

Boating, fishing, shellfishing, and swimming are all existing river-related recreational uses on the Narrow River (Map 7). Although no known formal studies of numbers and distribution of uses have been conducted, informal comments and observations indicate that shellfishing takes place mostly in the Middlebridge Bridge area; swimming, at community beaches in the middle river area, at organizational camps in the upper ponds, and at the mouth of the river; and fishing, around existing bridges and from boats along the entire river. Except for community beach and boating facilities, no public facilities for these activities exist on the river.

Boating access is available at private docks, primarily in the middle river area, and from a private marina and a public launching ramp. An estimated 600 boats use the river. Many are stored at the owners' homes and launched from community facilities or the launching ramp. River depths and bridge clearances limit the draft and height of boats -- most are less than 16 feet long. Boating activities are oriented to fishing and pleasure cruising along the entire length of the river, with the exception of the Cove area. The river is also used essentially as a protected area from which to gain Bay access.

One problem that has been identified for river-related recreation is the lack of developed public access facilities. Use of the river from non-designated areas often generates conflicts, such as between automobiles, boaters, and fishermen at Middlebridge Bridge, or through littering for which no agency has assumed the clean-up responsibilities. However, if

public recreational facilities are provided, care should be taken to orient these facilities to activities for which the river has the capacity and that are compatible with existing uses and resources. For instance, the development of boat access areas, if designed to serve motorboats rather than canoes or skiffs, would create additional congestion or incompatibilities with shellfishermen and swimmers.

Another problem derives from potential use conficts among on-river recreational activities. The river's limited width, particularly in the middle river area, and narrow channels in shoaled areas increase the potential for boating congestion. While the swimming and boating occurring in the narrow middle river areas are apparently not in conflict, there are always a few boaters who will create unsafe conditions by speeding in that area. If river use increases over time, areas in which potential conflicts may occur include the Middlebridge Bridge area, between fishermen, shellfishermen, and through-boaters; and the upper pond area between fishers, swimmers, and waterskiers.

Recreation on the upland areas of the watershed in North Kingstown is primarily oriented to organizational camps: YWCA, Boy Scouts, Newport Boys Club and Girl Scouts. The status of many of these camps is tenuous: the Kelgrant property is on the market; the YWCA camp may not still be in operation; the use of the Casey Farm by the Boys Club is on a lease basis. The state owns property on Silver Spring Lake for fishing of stocked trout and other species. Narragansett has two proposed parks in the watershed: one at Canonchet Farms and the other in the north end to be developed for active recreation. While Narragansett actively discourages hunting in the town, some hunting does occur in North and South Kingstown mostly on an informal basis.

Many historical structures and sites exist in the watershed, and are open to sightseers or can be viewed on an informal basis. Those that appear to be of particular state or local historic significance include Pettaquamscutt Rock, Gilbert Stuart Birthplace, and the Jireh Bull Garrison site. The Casey Farm and the Gilbert Stuart Birthplace are on the National Register of Historic Sites. Use of the watershed resources for educational or research purposes currently occurs, as evidenced by the numerous scientific studies of the Narrow River coming out of URI. However, the on-river facilities from which the studies are conducted are either non-existent or located on North Kingstown's upper pond property.

Although no great demand for additional upland facilities has been expressed during the course of this study, the extent of recreational, educational, and historic resources within the context of large, undeveloped

and virtually undisturbed acreage indicates a large potential for upland recreation.

Industrial and agricultural land use

Except for two areas in the north and south, no industrial uses occur within the watershed. Those industries that would be attracted to this region would probably require site conditions that are not found in the watershed. Very little land in active agriculture remains, with the exception of some farms in the ridge and Tower Hill areas. As is true for the rest of the state, agricultural use has been declining in the watershed, despite the existence of Class I agricultural soils and due in some part to the demand for land by other uses.

Land ownership

The patterns of land ownership in the watershed reflect the pattern of land uses and highlight the fact that much of the watershed remains in large acreage parcels (Map 8). The implications are two-fold: the potential for conservation of undeveloped land by individual owner initiative exists; so does the potential for the initiation of large-scale development. Because of the small size of the watershed, the impacts of either beneficial or adverse action on any one parcel would be significant.

ROADS AND UTILITIES

Roads and highways

Two primary arterial highways run through the watershed: Routes 1 and 138 (Map 9). They serve as regional links to the southern Rhode Island coast and Providence and to Jamestown and Newport respectively. Route 1A, a secondary arterial road and a designated scenic highway, runs along the coast from Wickford to Point Judith. Paralleling Route 1, it serves more local needs as well as recreational travel. Only two roads cross the river to connect Routes 1 and 1A: Bridgetown and Middlebridge Roads. These roads have dual purposes: to facilitate access from riverside communities to Routes 1 and 1A, and as through routes from the University of Rhode Island Bay Campus and Bonnet Shores to Kingston and Route 1. Other watershed roads serve residential neighborhoods and ultimately connect them to primary or secondary arterial roads.

Road system problems occur when development along the roads is not consistent with their speeds and purposes. Additional commercial or residential strip development along Route 1 as a high speed, limited access highway or Route 1A as a major arterial and scenic highway would probably create congestion, safety, and aesthetic problems. On cross-river roads, further unlimited driveway access, rather than frontage roads or common driveways, would probably increase conflicts between through traffic and neighborhood traffic. However, road widening or other improvements on Middlebridge or Bridgetown Roads to facilitate through-traffic would adversely affect the safety, noise levels, and residential character of adjacent neighborhoods.

Utilities

Public water service in the watershed is currently provided in Narragansett, will serve the river communities in South Kingstown in the near future, and is proposed for North Kingstown in the distant future. Public sewer service will be extended from Narragansett to the existing development on the eastern river shores, probably within four years. Storm drainage systems have been built in Narragansett in the middle river area, and are proposed for upgrading.

In Narragansett, extension of public sewer service to the middle river communities will ameliorate the reported problem of septic system pollution. However, because the availability of services will make higher densities possible, the provision of public sewers in this area may eventually result in additional urban runoff or sedimentation problems due to increased building. Similarly, water service to the Middlebridge area in South Kingstown is intended to serve existing development, but will enable additional "in-fill" residential development in the floodplain. Without consideration or control of the secondary environmental effects of utility extensions, such extensions may serve to guide or encourage growth in unsuitable watershed areas.

summary of analysis

THE NATURAL ENVIRONMENT

The geological and hydrological diversity and uncommon qualities of the river, the abundance of estuarine resources -- fish, shellfish, birds -- and the largely unaltered tidal wetlands and undeveloped upland areas that contribute to the water quality and viability of the estuary make the Narrow River a valuable coastal natural area. Although the watershed has not evidenced large-scale environmental problems, the incipient water quality pollution of the Narrow River will be aggravated if the following activities are allowed to continue: direct discharges of urban runoff from built-up shoreline development, septic system development in the floodplains, and erosion and sedimentation resulting from clearing and construction, particularly on steep, erodible slopes and adjacent to water bodies. Incremental filling and dredging of tidal wetlands and the displacement of vegetative cover through development will result in decreases in the numbers and/or species of wildlife over time. Even two-acre residential lots in watershed areas unsuitable by virtue of poor soils or steep soils, if developed as zoned, will cause environmental as well as service and development costs.

The solution to boating problems caused by shoaling to shallow depths around Middlebridge Bridge and at the river mouth will require further study. It is likely that spot dredging and/or bridge reconstruction to achieve freer tidal flows would be a beneficial option, but a decision for this alternative should be made only after a determination of the anticipated environmental and financial costs in relation to the anticipated benefits of the program.

The natural resources that are susceptible to environmental degradation from development or misuse are shown on Map 11: Ecological Constraints.

THE AESTHETIC ENVIRONMENT

Some of the most scenic views within the watershed are of the river landscape -- the river itself, the tidal wetlands and vegetated edges, and the wooded bluff running along the western ridgeline. However, where vegetation has been extensively cleared or where development has

occurred at the water's or wetland's edge, scenic value has been diminished. A continuation of development patterns without consideration of the cutting of vegetation or without control of the siting and design of development within the woodlands will decrease the existing natural image of the watershed.

The roadways, historic sites and structures, and towns within the watershed are also aesthetically valuable resources. Strip development along the roads, suburban sprawl, inappropriately sized signage, and the cutting of background woodlands or roadside tree rows have detracted from the value of these built resources in the past. Without controls over the pattern and design of development to protect existing values and without active programs to enhance the scenic quality of road rights-of-way and vistas, the aesthetic character of the built environment will be lost.

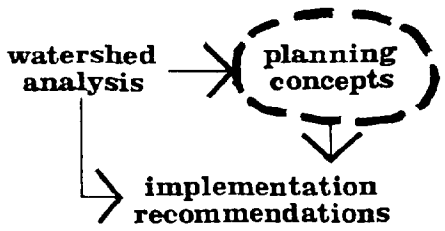
THE CULTURAL ENVIRONMENT

The predominance of residential, recreational, and open space uses in the watershed and the absence of industrial and large-scale commercial uses has not only provided a pleasant community environment but also the opportunity to plan for future growth in keeping with the environmental values of the watershed. However, continued growth of even residential development as zoned would create environmental problems as well as a decrease in the quality of community life. Residential development in the floodplain continues to be an allowed use that has negative social, aesthetic, and environmental repercussions. Existing land use controls to both concentrate community development in appropriate areas -- in terms of physical suitability and service levels -- and to minimize development in inappropriate areas are weak. While the towns do regulate development on some environmental resources, the ordinances are neither comprehensive nor uniform.

The river itself and its fish and shellfish, the large extent of undeveloped lands particularly in the north, and the many preserved historic sites throughout the watershed are prime recreational resources. A major long-term problem with respect to recreational use is conflicts among users and a decrease in user satisfaction if additional recreational development occurs without watershed-wide coordination. Unless conscious decisions on recreational priorities are made, the existing opportunities provided by the recreational resources and undeveloped lands may be lost. Because many of these resources are on privately-owned land with few restrictions on future uses, recreation plans need to include provisions

for both public and private participation.

Problem areas arising from unplanned growth in the watershed are shown on Map 12: Implications of Unplanned Growth.



concepts for the river and its watershed

introduction

The Narrow River and its watershed possess numerous resources of considerable importance. Future development in the watershed should not merely conform passively to the constraints inherent in the use of these resources, but should turn their scenic, ecological, and recreational potential to positive advantage. The following natural and man-made watershed resources combine to form the principal basis for concept development:

- the estuarine system and its biotic resources
- the scenic quality of the river corridor: the river, the western bluff, the tidal wetlands, and vegetated uplands
- the abundance of undeveloped land, particularly in the northern watershed
- the predominance of semi-rural, non-commercial and non-industrial land uses

- the pivotal position of the watershed in the region
- the historical sites and structures

The river and its biotic, scenic, and historic resources, combined with its largely undeveloped shoreline and upland bluffs, suggest the need to strike a careful balance between future development and the need to protect the landscape from overuse and abuse. The watershed can serve dual purposes as a conserved landscape of high scenic value and a recreational landscape serving residents of the watershed and state. The natural character and image of the watershed can be enhanced and maintained by promoting the development of limited recreational facilities within the framework of a scenic open space corridor along the river valley. The watershed's close proximity to an intensively used coastal edge and four growing communities underscores its value and viability as a recreation and open space corridor.

The estuarine system within the Narrow River should be prized as a valuable scientific resource. The importance of preserving and studying estuaries is a recognized purpose of the state Coastal Resources Management Act as well as the federal Coastal Zone Management Program. The importance of the Narrow River estuary suggests the need to carefully manage future development in the watershed to guide development patterns so that the overall change of the watershed's character will be minimized. A continuation and expansion of scientific study and other educational uses of the river's environmental resources should be a priority goal of plan development.

Existing village centers should remain the focal point for further community development in the watershed. Public capital improvements and residential amenities should be concentrated in these centers to reinforce their community character and enhance their ability to attract new development. Development outside of designated centers should be strongly discouraged to safeguard abundant space for recreational, open space, or scientific purposes. Economic incentives along with land acquisition and dedication programs should be combined with an effective mixture of land use controls to carry forth this concept. These concepts would provide for a viable economy within the watershed while greatly enhancing recreational, educational, and scenic resources for its residents.

The concept plan (Map 13) describes a watershed in which maintenance of the existing scenic character of the watershed and balanced recreational development play central roles. Watershed lands and shores at the upper and lower ends of the river, linked visually and physically by the river and its ridgeline corridor, become part of new "frameworks" in which public and private lands are protected to conserve the existing

landscape and to serve new park, recreation, education, and scientific objectives. Community development is accommodated and structured in compact, quality-designed village centers and open space is maintained to enhance community life as well as the amenity value of the watershed.

summary of plan concepts

MANAGING ENVIRONMENTAL, RECREATIONAL, EDUCATIONAL, AND OPEN SPACE RESOURCES

Upper river framework

The upper river area has high potential for serving as a key natural area focus, within which compatible public and private land uses could co-exist. An ideal way to bring this about would be to develop a "public-private partnership" within which public acquisitions, zoning, and environmental regulations would be coordinated with voluntary actions by land owners to achieve a high quality environment. The physical framework within which this partnership would be effectuated could be considered as an Upper Narrow River "Park" and would emphasize low-key recreational, scientific and educational, and other compatible land uses. The large land holdings, low level of development, and unsuitability of the land for intensive community development increase the feasibility of such use. The Park, which might be modeled on the Adirondack State Park[1] of New York State, and which could focus around the Gilbert Stuart birthplace, on the watershed's most important historic sites, could serve as a low key magnet for watershed visitors, generating new local revenue without creating crowd, traffic congestion, or land development problems. The public areas of the Park, and private lands whose owners are interested in offering such services, could provide a wide range of recreational and educational activities: camping, hiking, nature trails, sightseeing of historic sites, fishing, shellfishing, non-motorized boating from public or private concessions, and swimming. Due to the physical unsuitability of the area for large scale and intensive development and in order to fully utilize the recreational potential of the scenic woodlands and shorelines, upland Park activities should be primarily passive and low intensity with minimal constructed facilities. Scientific and educational study of the Upper Pond area should be a priority use, and additional facilities to serve such research should be incorporated as major park elements, The Park should include not only those lands on which facilities are developed, but also those that are necessary to the protection of scenic, recreational, and educational resources.

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[1] Refs. 3, 4. Reading List and Contracts

Participating landowners would be partly compensated for restrictions on their land by new commercial recreation, camping, natural area interpretation, and other recreation-related activities, which the state could guide and encourage.

Lower river framework

The lower river area can be seen as a second "Park" framework, within which a public-private partnership can work to protect environmental resources and fortify community quality. The more highly developed urban edges of the "Lower Park" in Narragansett need not be inconsistent with any future estuarine sanctuary or critical area designation for the Park's center, if careful safeguards are instituted.

- Canonchet Farms, under present plans, may be developed in the future for use by the Town of Narragansett, with conservation of the wetlands and upland edges for educational or open space purposes. This program should be supported.

- The opportunity exists on the western shore just south of Middlebridge Bridge for development of water-oriented recreational facilities (picnicking, shellfishing, canoe rentals). This opportunity should be realized, providing construction is limited and does not require filling of wetlands.

- The extensive wetlands and undeveloped upland habitat on the west side of Boston Neck should be acquired by state or local entities or a quasi-public conservation trust for educational and scientific uses. The Town of Narragansett might acquire the wetlands, the railroad and sewer line right-of-way, and the land in between. Conservation trusts could supplement public land holdings.

- Other lands within the Lower Park, whether public or private, should also be properly managed, under the partnership concept, to accentuate the environmental values, attractiveness, and recreational potential of the area.

Estuarine sanctuary designation

Section 312 of the Coastal Zone Management Act (1972) establishes a mechanism and funding for designating "estuarine sanctuaries": estuaries and adjoining uplands that are representative of a region and are to be preserved for educational and scientific study and research.

In order to qualify under this program, an estuary must satisfy criteria established by the Office of Coastal Zone Management, National Oceanic and Atmospheric Administration under Section 312 of the Coastal Zone Management Act of 1972. It must be representative of a region -- here, the Virginian Biogeographic Region and be in a natural and essentially unmodified state. Activities occurring outside of the sanctuary must be controlled or managed to prevent possible adverse impacts on the sanctuary.

Within the Narrow River watershed, the southern reaches (southeast of Middlebridge, Pettaquamscutt Cove, the Narrows) would probably qualify in terms of the diversity and typicality of the resources. However, the potential difficulty of controlling the effects of other watershed uses on the sanctuary mitigates against its selection. In the upper river, the lack of development and modifications would increase the feasibility of acquisition and control, but the geology and hydrology of the two ponds is unique rather than typical of the region.

Because of the uncertainty that either area would qualify, designation of an estuarine sanctuary in the Narrow River watershed is not a priority plan concept. However, the CRMC should sponsor a comparative evaluation of other state estuaries and a more complete evaluation of the Narrow River as a basis for selecting a candidate site. Further action toward designating a sanctuary should occur in the near future in order that, if the Narrow River is identified as a priority site, planning for the watershed can be directed in accordance with established sanctuary requirements.

Other kinds of designation and policies may be applicable. The Narrow River was described as "unique" in the Environmental Base Study (University of Massachusetts, 1972) of the Southeastern New England Study and as one of the 28 most valuable natural coastal areas in Rhode Island by the URI Coastal Resources Center (Seavey, 1975). The designation of at least key portions of the watershed as critical environmental areas under the CRMC would provide additional protection of watershed resources. In addition, the Coastal Resources Management Council has proposed that the Narrow River be designated as an area of particular concern in the State's Coastal Management Plan.

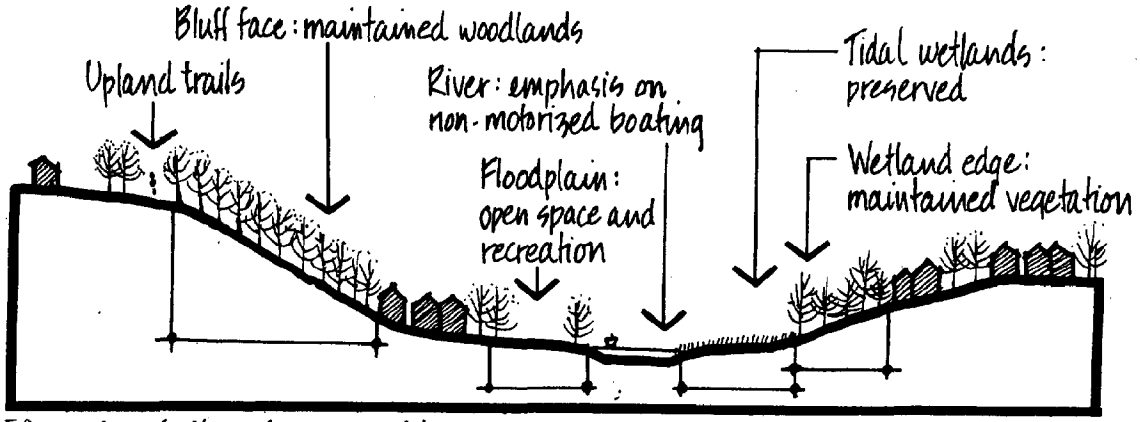
River corridor

The two activity areas described above are linked both visually and physically by the river corridor: the western ridgeline bluff face and crest, tidal wetlands, floodplain areas, the river itself, and the slopes of Boston Neck on the east. Because these landscape elements establish the strong open space character of the watershed, and because

development of them would have a high probability of adverse environmental impacts, they should be strongly protected from further development.

In addition, the corridor can function as a physical link between the two park nodes, optimizing the range of recreational activities available to a user. Hiking, biking, and nature study trails along the river or upland areas, and utilizing existing road and utility rights-of-way, is one means of linking use areas and of providing additional recreation activities. The river itself provides the most obvious link among resources and activities. A boat rented in the upper or lower river could be paddled to fishing, shellfishing, and shoreline picnicking areas along the river.

While motorboating, particularly from riverside communities, is an existing and valid use of the river, it is generally incompatible with most of the water-based activities mentioned above. Encouraging boat rental facilities for non-motorized boats, and discouraging further private motorboat facility development, are policies that should be adopted as consistent with the multiple-use concept of relatively passive upland and on-river activities.

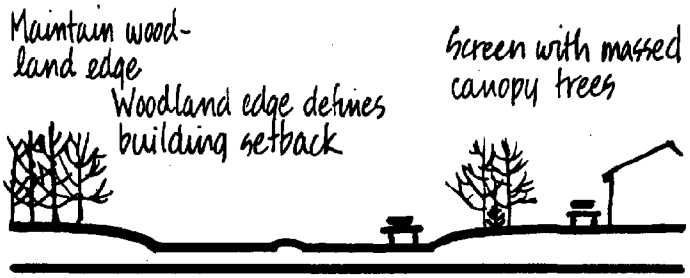


Elements of the river corridor

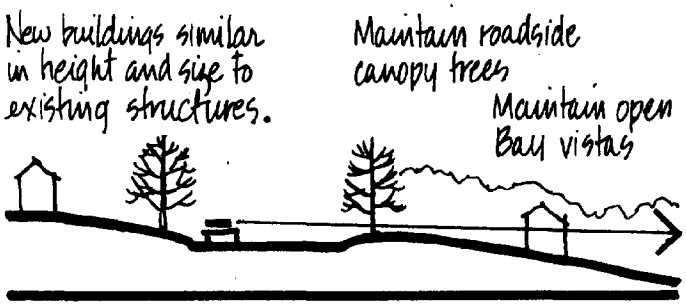
Road corridors

Views from the primary watershed roads are important in revealing the scenic qualities of the watershed. Existing scenic vistas and other aesthetic resources within the corridors should be maintainted. Other less scenic areas should be enhanced through additional right-of-way plantings or through selective clearing of thick woodland underbrush

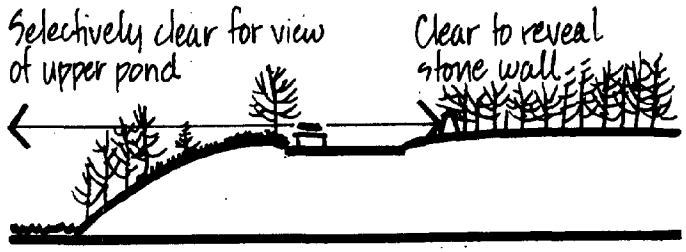
between roads and stone walls or to other scenic elements. Because the legal road right-of-way often does not coincide with the limits of the views, additional measures such as sign ordinances, cluster residential and commercial zoning, and buffer requirements can be taken to maintain or enhance these views.



Route 1 - Tower Hill Road



Route 1A - Boston Neck Road



Gilbert Stuart Road

ENHANCING THE QUALITY OF COMMUNITY LIFE

Community development clusters

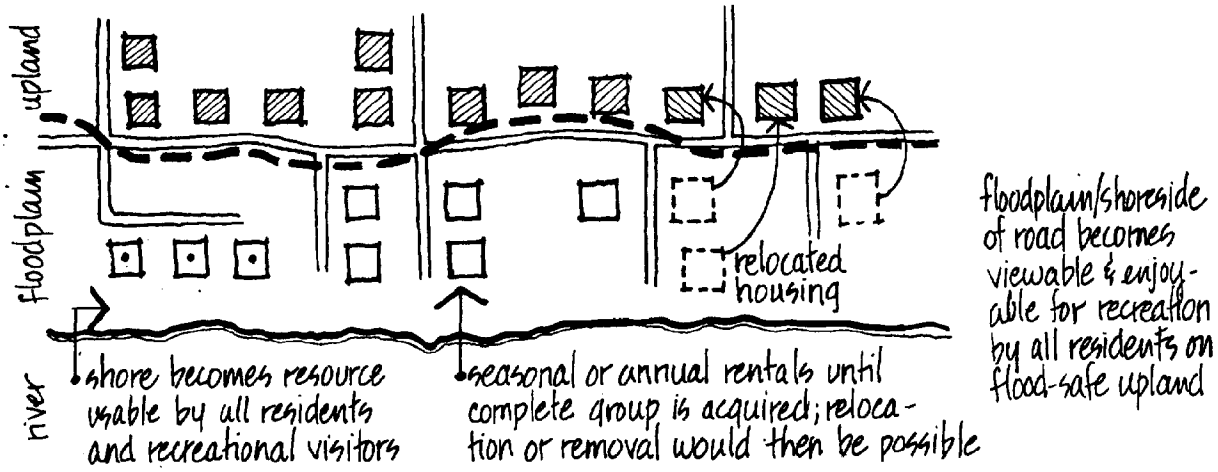
Selected, suitable centers within existing developed areas in the watershed should become the focal points for further community growth. New development can be concentrated to function as village centers for existing neighborhoods and in order to maintain the larger scale open space amenities of the watershed. The pattern of development should rely largely on clustered housing and compact layout of village centers, to facilitate efficient provision of services and to provide community open space. The existing levels of development and future public sewer extension into the middle river communities in Narragansett suggest the potential for structuring growth to create village clusters. Other watershed communities with fewer soils limitations and other environmental constraints can accommodate additional watershed development, albeit at lower densities.

Thus, three development zones should be recognized: selected village centers, with moderately high densities and neighborhood shopping and services; existing developed neighborhoods adjacent to the village centers, where infill could be used to increase densities somewhat; and the undeveloped watershed, where existing low densities and open space uses should be retained.

Flood hazard prevention

The most effective means of preventing the personal and social costs of coastal flooding is to maintain an undeveloped floodplain. Adoption of zoning bylaws by the towns to prohibit further floodplain development, in conjunction with a long-term program of voluntary and assisted housing relocation from the floodplain, would not only reduce the number of exposures to flood hazards, but would open the floodplain to local and community recreation use and would enhance the aesthetic quality of the river corridor. Land swaps and other means could be utilized to encourage house-moving and relocation to lands just above the floodplain so that present floodplain occupants could still reside within yards of the river. In order to deal with the problems of scattered vacant houses or lots inherent in the long-term phasing out of development, buildings could be leased back to owners or seasonal or annual renters until a group of contiguous lots were acquired. With a modest initial capitalization, the revolving fund created to make such actions feasible could probably function effectively, using rental income during the phasing out period to offset purchase costs. The fund, and the management of such a floodplain improvements program, would be

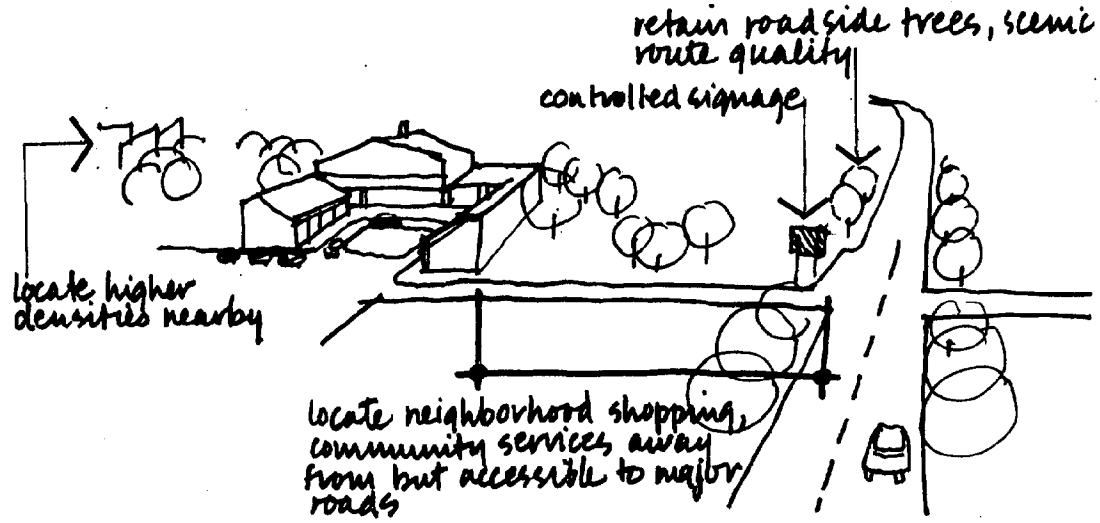
most effectively administered by special commissions in the Towns of Narragansett and South Kingstown, or possibly under state auspices.



Floodplain redevelopment

Road corridor development clusters

Development along watershed roads should be evaulated not only in terms of its effect on the aesthetic character of the corridor, but also in terms of its effect on neighborhood and highway-related service needs and on the safety and efficiency of travel. Particularly for travelers on Route 138 and Route 1, the provision of highway-related



Commercial cluster development

service facilities may be justified in time. If so, the facilities should be accommodated within designated zones in which development will be clustered and set back from the road. Similar development guidelines should be adopted for neighborhood services, if and when community populations grow to require and support them.

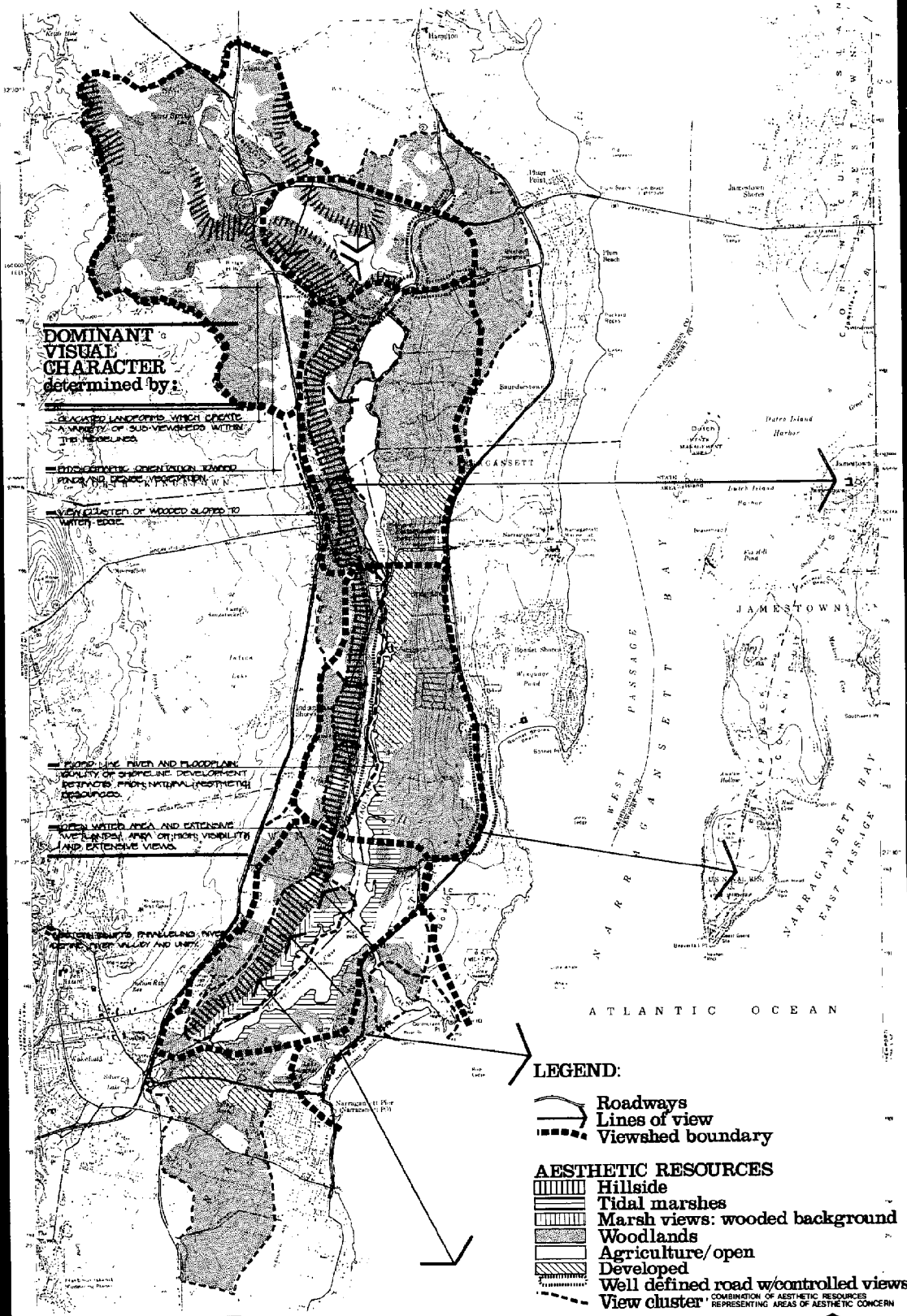
Low density residential development

In areas of the watershed that are zoned for one- or two-acre residential development, and which are not physically suited to higher densities, clustered development should be encouraged. While gross densities would remain constant, clustering of housing can maintain the open space character of the watershed and avoid certain potential costs of urban sprawl.[1]

Environmental management

Although wise environmental management is an inherent component of each of the concept areas defined above, it must also be recognized and effectuated through independent programs at various levels of government and through self-policing and voluntary efforts in the private sector. Only through a genuine "partnership" approach, with landowners and individual citizens shouldering responsibilities along with public agencies, can the lands and water of the watershed be protected as well as used and enjoyed.

[1] See Reading List and Contacts: N° 2.



Aesthetic Resources

A PLAN FOR THE NARROW RIVER WATERSHED
Tri-Town Narrow River Planning Committee

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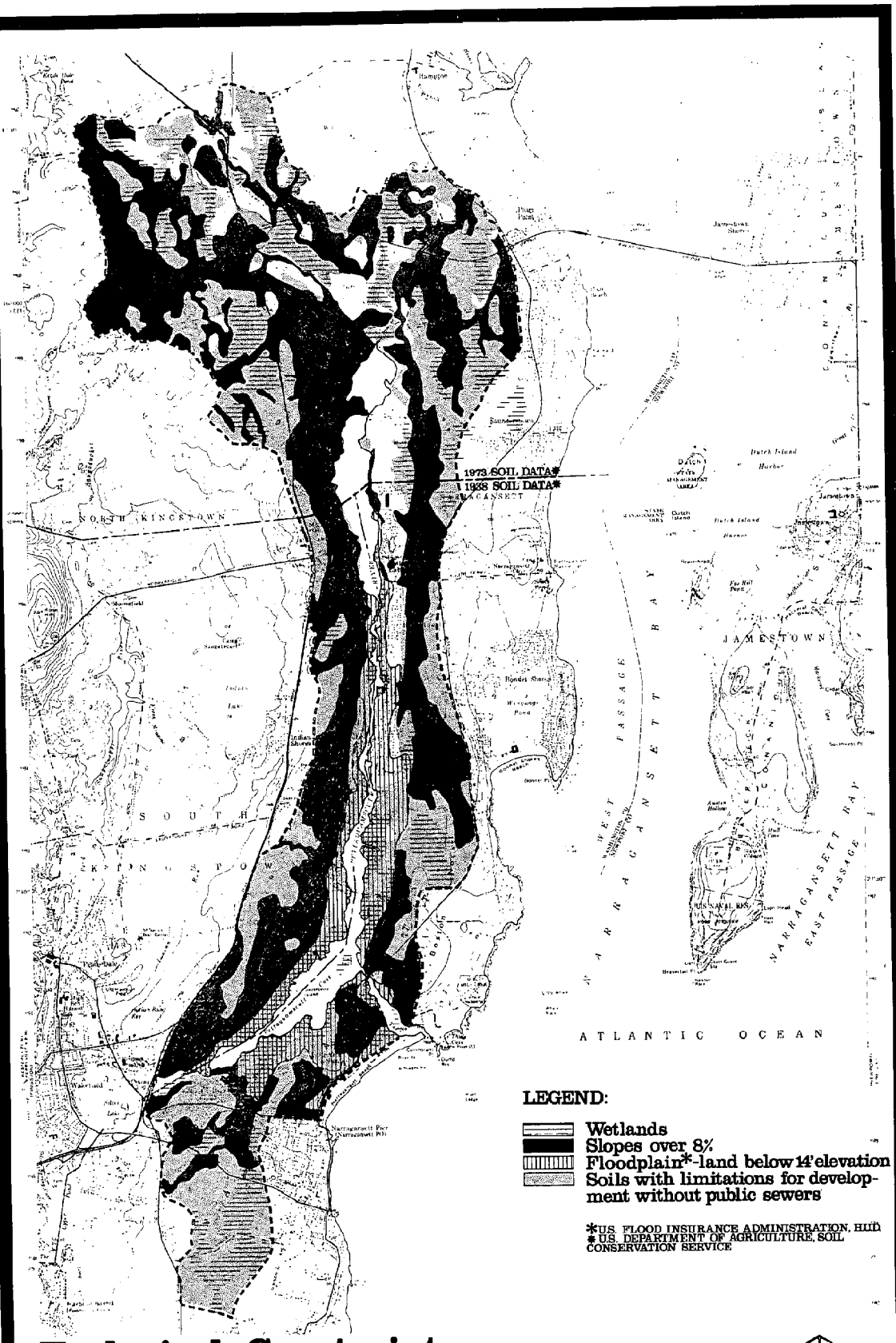

Ecological Constraints

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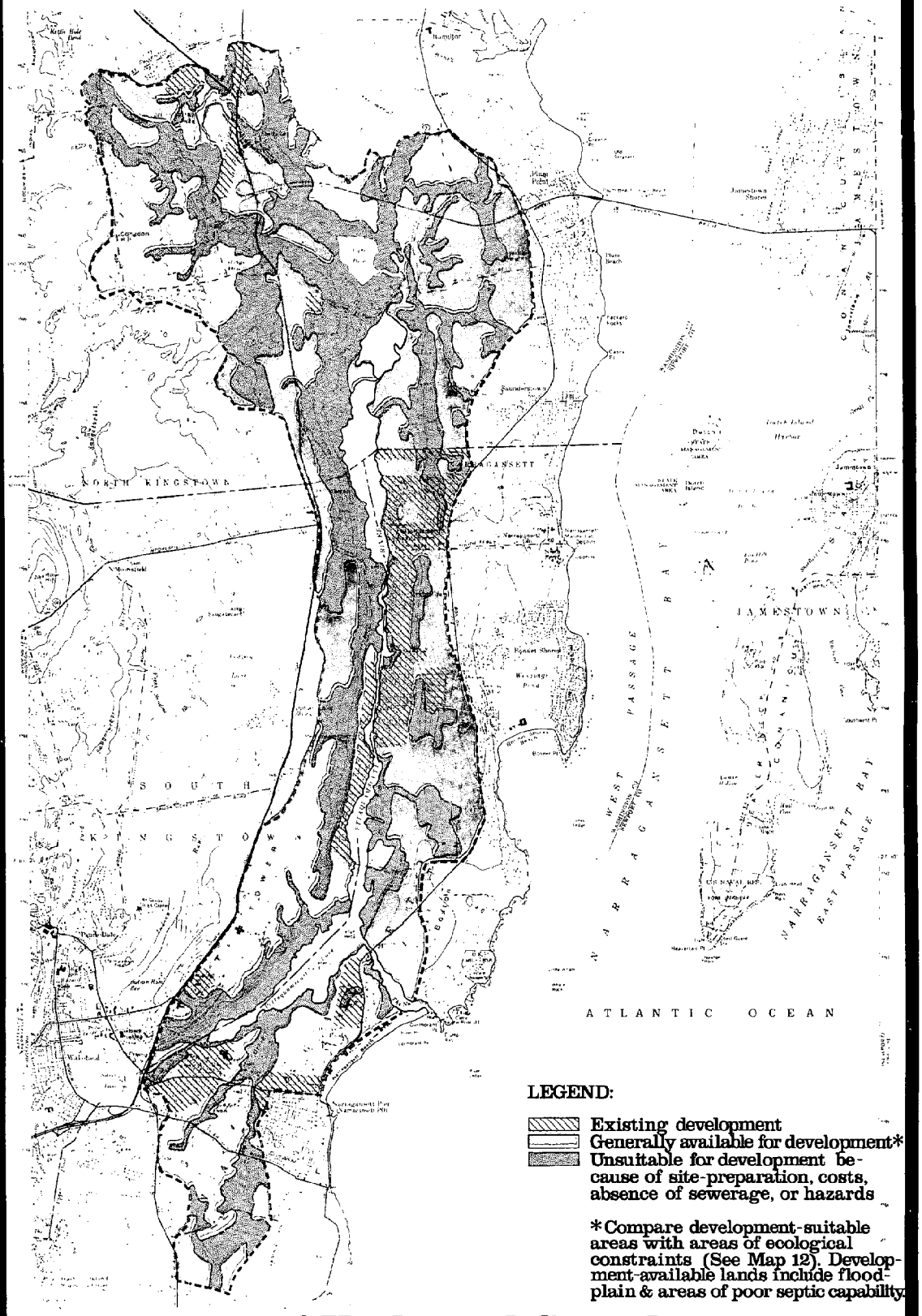

LEGEND:

- Existing development
- Generally available for development*
- Unsuitable for development because of site-preparation, costs, absence of sewerage, or hazards

*Compare development-suitable areas with areas of ecological constraints (See Map 12). Development-available lands include floodplain & areas of poor septic capability.

Implications of Unplanned Growth

A PLAN FOR THE NARROW RIVER WATERSHED
Tri-Town Narrow River Planning Committee

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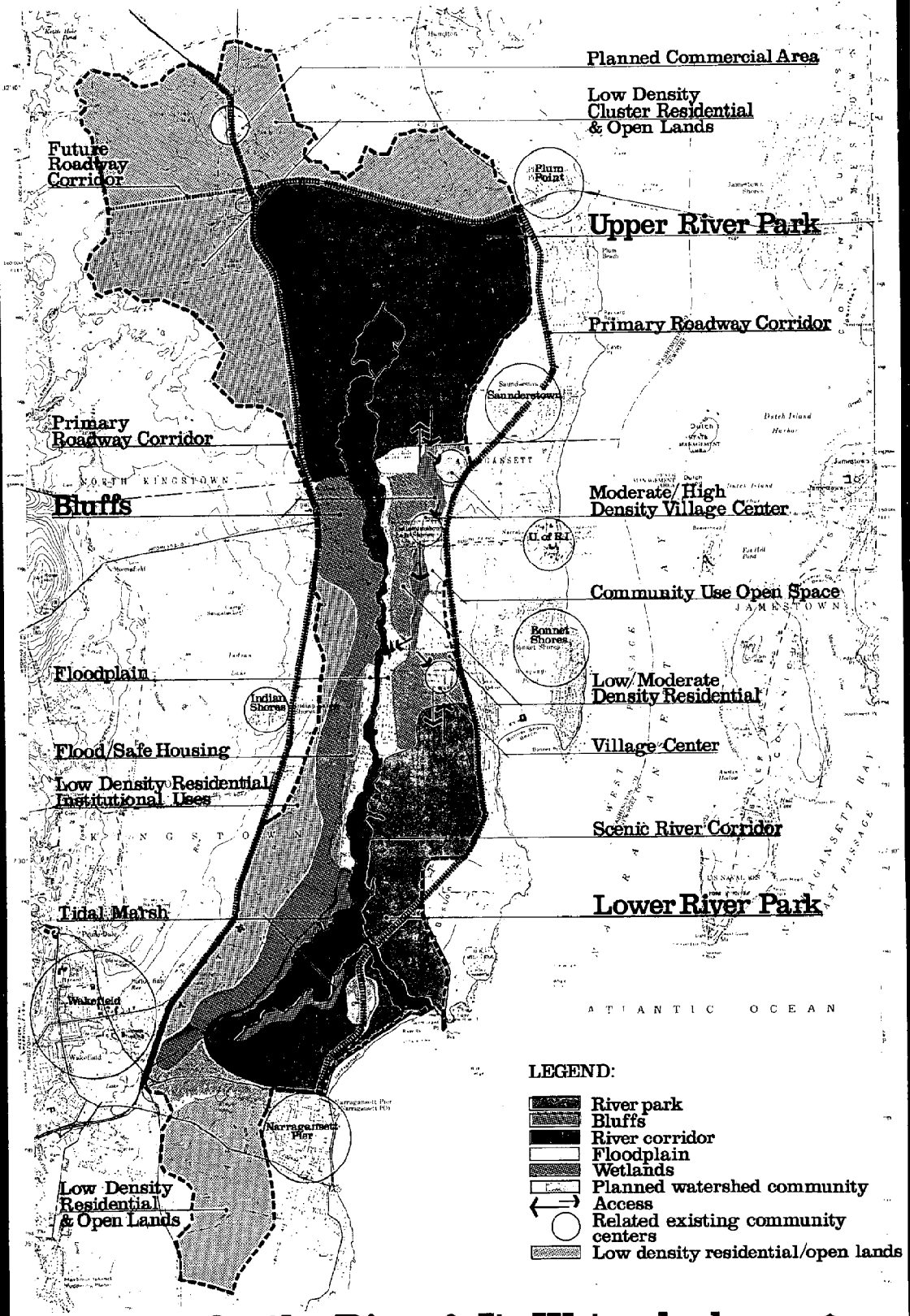

Concepts for the River & Its Watershed

A PLAN FOR THE NARROW RIVER WATERSHED
Tri-Town Narrow River Planning Committee

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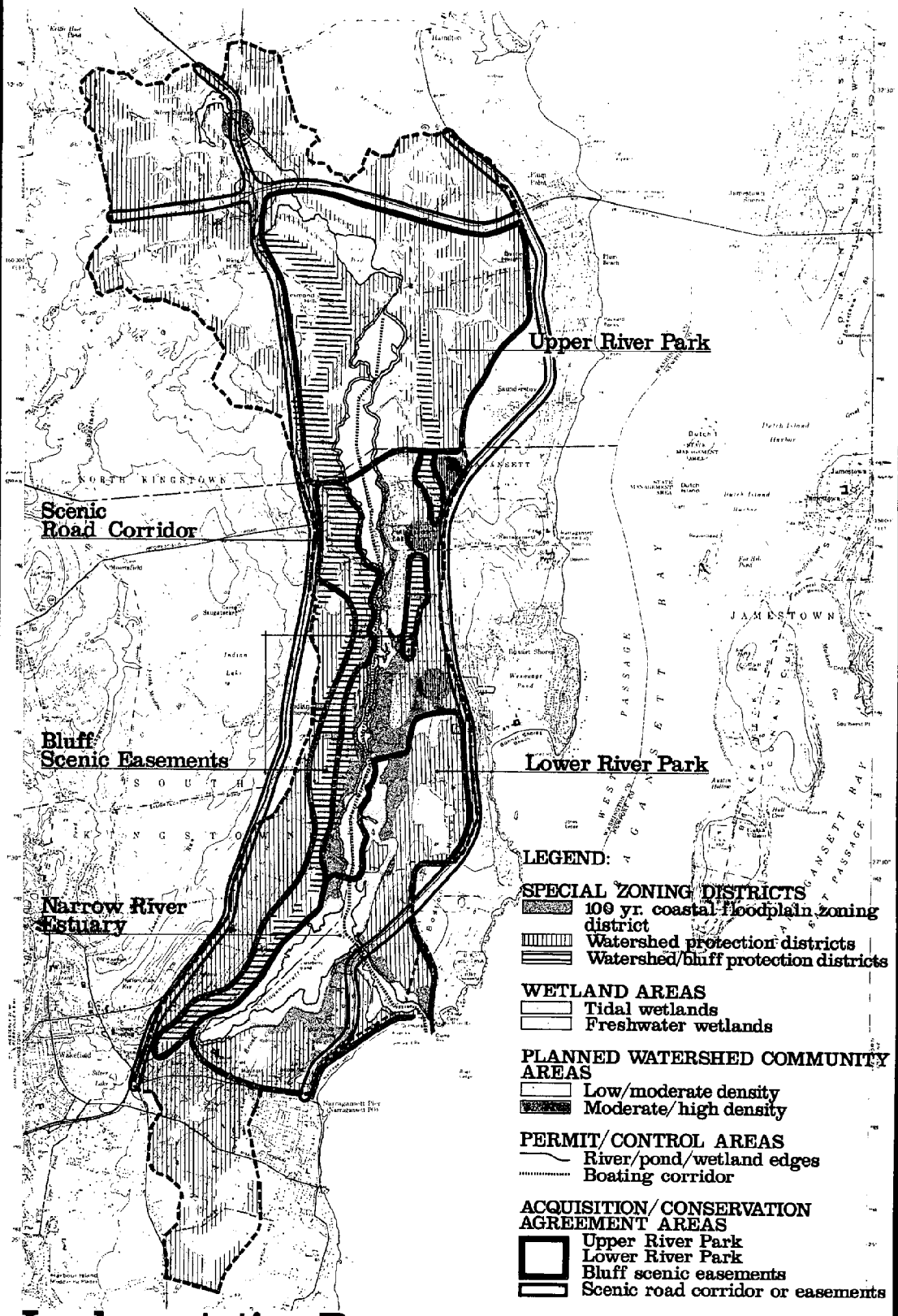

Implementation Program

A PLAN FOR THE NARROW RIVER WATERSHED

Tri-Town Narrow River Planning Committee

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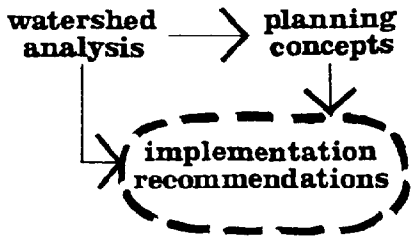

plan implementation

The Narrow River watershed concept plan suggests a series of actions that will assure the preservation of the Narrow River's unique resources while providing an attractive environment for community growth channeled to ecologically suitable village areas. Initiation of action towards this end can be guided by a strategy identifying effective tools for the implementation of each plan element as well as well-defined roles for local and state government and the private sector. The careful development of this strategy will result in the successful implementation of the Narrow River watershed concept plan.

option 1: Reliance on Existing Land Management and Protection Programs

This strategy would rely on existing local and state regulatory programs to implement the plan. It is based on the assumption that no new regulatory measures would be adopted, and that local and state agencies

would acquire watershed lands according to existing priorities and schedules for area land acquisition.

Existing zoning ordinances and subdivision regulations of the three towns describe densities and land uses that are generally consistent with the ecological suitability, levels of public services, and growth trends of the watershed. Existing and evolving regulatory programs of the Coastal Resources Management Council will help assure that the watershed is managed as a valuable coastal resource. Additional state programs of the Department of Health, Department of Natural Resources and the Office of State Planning will also help minimize impacts of development on valuable resources.

This strategy represents an attractive option since the burden of administering local and state regulatory programs would not be increased, nor would governmental agencies be encumbered with large scale land acquisition costs and other efforts. The Narrow River watershed is, however, an attractive location for urban and possibly energy-related growth, and existing local regulatory programs will not forestall or adequately shape increased development for long. Though existing state programs safeguard valuable natural resources, they will not prevent the long term cumulative effects of development in the watershed. Finally, if public land acquisition and protection are not vigorously pursued, many valuable corridor parcels will be acquired and developed in wasteful and environmentally incompatible patterns well in advance of future beneficial local or state actions.

A strategy relying entirely on existing regulatory programs and existing levels of public land acquisition thus will not assure the successful implementation of the watershed plan.

option 2: Extensive Public Acquisition and Increased Regulation

This strategy would rely on a large scale public acquisition program and increased local and state land use regulation. It is based on the assumption that public acquisition would be used to assure the preservation of all areas in the watershed of high potential public recreational, ecological, educational, scientific, or scenic value. Public

acquisition would be coupled with moratoriums on development, restrictive zoning,or similar restrictive regulations to forestall development of lands scheduled for acquisition. Legislative support in the form of appropriations for land acquisition and enabling legislation to authorize increased restrictions on land use development would be essential to the success of this strategy.

Although large scale public acquisition could assure the implementation of the corridor plan, it would be a prohibitively expensive means of land use control. If coupled with a severely restrictive regulatory program, free choice and independent decisions for wise land management could be unreasonably thwarted. The strategy might also backfire, alienating watershed residents, members of the town governments, and state legislators who might otherwise lend cooperative support to plan implementation.

option 3: A Combination Strategy

This strategy combines existing local and state acquisition, regulatory, educational, and advisory programs with new tools as well as recommended new measures to implement the concept plan. This approach strikes a balance between Options 1 and 2 and represents the proposed strategy for plan implementation.

GROWTH MANAGEMENT

Unplanned growth could result in the loss of valuable watershed resources. Future growth should be guided to suitable locations and minimized in areas inappropriate for development.

VILLAGE CENTERS COULD BECOME THE FOCAL POINTS FOR FUTURE DEVELOPMENT.

Existing developed areas could become the focal points for most future land use development in the watershed. These areas could evolve as attractive, compact village centers in the finest of Rhode Island town traditions, providing housing, commercial facilities, and more easily accessible and energy-efficient public services for watershed residents and visitors.

Zoning and subdivision

Amending existing zoning and subdivision regulations to permit neighborhood commercial and higher density residential development (2 to 4 units per acre or greater, with design review by the planning boards) in selected areas would provide an initial basis for stimulating the growth of village centers. Plan Unit Development (PUD) and cluster development provisions could be added to existing town codes to further reinforce the selected village centers and help upgrade neighborhood design in the adjacent existing areas.

Through PUD provisions, prospective developers could be permitted to integrate residential, commercial, and open space uses within the development of a single land parcel. Cluster provisions could be used in conjunction with PUD's to allow clustering of site uses. These provisions could be enforced through a site plan appraisal process which would afford local zoning boards the opportunity to negotiate with developers to assure that final projects were fully consistent with local plans for the area. Cluster and PUD provisions could be applied to highway commercial development, as well as village centers, to improve site design along Routes 1 and 1A.

Through cluster and PUD provisions, the towns could substantially reduce capital investments in roads, utilities, and related services for future watershed development. Heating and cooling requirements for clustered commercial establishments could also be reduced, as well as fuel requirements for car-using shoppers. The towns could also retain increased open space and secure improved site designs on the basis of these measures.[1] Although there are no references to PUD and cluster provisions existing in Rhode Island enabling legislation, many communities, including North Kingstown, now use them. (Legislation is proposed for the upcoming session of the state legislature to amend state statutes to include these provisions.)

Capital improvements

Town capital improvements programming could also be used to stimulate future growth in the village centers. The allocation of public capital investments for roads, sewers, water, and related services for these areas, in conformance with comprehensive plans drawn up by the towns, could be afforded high priority. By providing the infrastructure and services necessary to support future development in desirable and energy-efficient patterns, the village centers could become particularly

[1] See Reading List and Contacts: N° 1.

attractive growth areas. In a like manner, denial of improvements in those areas deemed inappropriate for development would impede growth, thereby assuring conservation of valuable open space while reinforcing growth and development within the village centers.

Official mapping

As an adjunct to the capital improvement policies, the towns could prepare and revise official town maps with specific delineation of improved road systems and new municipal areas within the village clusters. Chapter 45-23.1 of the Rhode Island General Laws enables communities to adopt official maps showing the location of streets "existing and established by law as public streets" and the exterior lines of "other streets deemed necessary by the city or town council for sound physical development" (Rhode Island Statewide Planning Program, 1975). Based on the official maps, the towns can prevent the development of land not abutting a mapped street by denying building permits. Through this measure, the communities can focus future development in the village centers and prevent unplanned development outside the centers. Capital improvements programming and official mapping actions are both existing tools that can be acted upon without delay in the implementation of the concept plan.

OPEN SPACE AND SCENIC AMENITIES CAN BE MAXIMIZED BY MINIMIZING LAND USE DEVELOPMENT IN OUTLYING AREAS.

Zoning and subdivision

By preventing widespread growth and development outside of village centers, the open character and natural amenities of the watershed can be maintained. These outlying areas, including some on the fringe of the random housing development on Boston Neck, could be revised for the lowest density residential development permissible (2 acres/dwelling unit). This action could be coupled with comprehensive plan requirements for compact village development, as well as cluster provisions to require that any subdivisions involving more than six acres, or more than three lot divisions, be developed on a cluster design basis. These measures represent the most restrictive steps the communities could take within the context of traditional zoning. Although they will assure a more attractive form of low density development, they will not necessarily prevent sprawl or large scale subdivision if the adopted zoning changes are revised or otherwise made ineffective upon the emergence of future development pressures.

Transfer of development rights

Local government cannot prevent totally the development of land through traditional zoning without compensating affected land owners, unless special district zoning or other special measures are instituted. Zoning in conjunction with Transfer of Development Rights (TDR) is a measure recently developed to alleviate this problem. TDR uses the open market to compensate individuals deprived of development rights on their land through local zoning.

A TDR program involves the development of a zoning plan in which some areas are zoned for intensive development while other areas are zoned for limited or no development. Next, each acre of land within the zoning jurisdiction is assigned an equal share of development rights. The distribution of rights is designed to insure that areas zoned for limited development have a surplus of rights, while areas zoned for intensive development are provided insufficient rights to proceed with development. A market system thus evolves, within which individuals seeking to develop intensive uses must acquire additional rights in advance of their projects. By selling their surplus development rights on the open market, owners of restricted lands are thus compensated.

A TDR process could be used as a comprehensive growth management program in the watershed to concentrate development in village centers while minimizing development in outlying areas. Existing state enabling legislation and the complex administrative systems required have, however, impeded widespread use of TDR programs. Existing Rhode Island enabling legislation will have to be appropriately amended in advance of any application of TDR in the state. The towns would also have to amend existing ordinances and develop a process for allocating and recording the exchange of development rights. This process could be simplified if the towns elected to utilize TDR within the watershed alone through a special district zoning provision (watershed lands being easily and reasonably recognized as falling within a district of special character).

Land banking

Land banking represents another possible approach to managing future development in the watershed. Land banking consists of public acquisition of land eminently threatened by private development. Quasi-public acquisition (by public interest, non-profit organizations) can achieve the same ends. Subsequent to such acquisition, land can be resold or leased to prospective developers with deed restrictions or lease agreements pre-

scribing its future use. A land banking program could be used, for example, to manage future growth within village centers and to minimize development in outlying areas.

An effective land banking program would require a substantial investment of public capital. This, in conjunction with the reduction in local property tax revenues associated with public land acquisition, renders this measure an expensive growth management technique. While communities can be reimbursed for their initial outlays through sell-back and lease-back arrangements, revenues from these arrangements may be delayed for several years. Thus the principal disadvantage of a land banking program is cash-flow.

GROWTH MANAGEMENT RECOMMENDATIONS

The following recommendations are presented according to those that can be acted upon immediately and those that will require state legislative action or the development of significant new funding in advance of implementation.

Immediate Action

- *Narragansett should be encouraged to amend existing zoning and subdivision regulations to permit neighborhood clustered commercial development on Boston Neck, and clustered single family detached, townhouses, and garden apartments, or other forms of multi-family residential development in suggested village centers at densities of two to four units per acre or greater under appropriate design controls.*

- *The watershed towns should be encouraged to zone existing partly developed areas outside the suggested village centers for low to moderate density development and to hold low densities in other watershed areas.*

- *The watershed towns should be encouraged to use capital improvements programming and official mapping to focus future road construction, sewer and water facilities, and other public services in the suggested village centers.*

Longer Term Action

- *Legislation to add cluster and PUD provisions to existing state enabling legislation should be supported and Narragansett and South Kingstown should be encouraged to add cluster and PUD provisions to existing zoning ordinances and subdivision regulations.*

- *TDR should be afforded careful consideration as a future growth management program for the watershed.*

- *Initiation of a public land banking program should be encouraged in North Kingstown and Narragansett to manage growth in suggested village centers and to retard large scale development in outlying areas.*

- *Easements and other less-than-fee rights should be acquired, and tax incentives adopted in the three towns when either full title purchase or protection through zoning appear unworkable.*

DEVELOPING OPEN SPACE, RECREATIONAL, SCIENTIFIC, AND EDUCATIONAL RESOURCES

A strong recreational and educational role for the corridor could preserve its natural and scenic resources and could form the nucleus of a regional natural resource-based economy. The upper and lower parks and intervening river and road corridors will provide ample frameworks for accomplishing this purpose.

PUBLIC ACQUISITION COULD SERVE AS THE PRINCIPAL BASIS FOR PRESERVING VALUABLE WATERSHED RESOURCES.

Public acquisition of full or partial interest in land is the principal means of reserving open space for public recreation or educational facilities. Acquisition of full interest involves the outright purchase of fee simple title to land, whereas acquisition of partial interest involves the purchase of easements or development rights.

Public acquisition would assure the long-term preservation and public use of valuable corridor resources. However, it requires large scale capital investments on a short-term basis and reduced local property tax revenues by removing land from the local tax rolls.

Land acquisition is also a time consuming process and will require the concerted efforts of several local, state, and private entities. The need for an organization designed to coordinate the acquisition program, as well as other implementation strategies is foreseen, and three alternative organizational structures have been identified in the Organizational Considerations Section. Among the alternatives advanced, a watershed commission patterned along the lines of the Adirondack Park Agency in the state of New York would prove most effective.[1]

[1] See Reading List and Contacts: N° 4.

Several financial assistance programs can be used by state and local governments to defray the costs of land acquisition. The following table summarizes these programs and their potential applicability to the Narrow River Corridor.

U.S. and Rhode Island Land Acquisition Assistance Programs

Program/Agency	Eligible Recipients	Summary of Applications
Land and Water Conservation Fund, BOR, DOI	State and local government	Recreation planning, development and land acquisition for all park facilities
Estuarine Sanctuary Program, OCZM, NOAA	State government	Acquisition and management of an estuarine sanctuary in the upper river park area
Community Development Program, Dept. of HUD	Local government	Recreation planning, development and land acquisition for local park facilities throughout the watershed
Fish Restoration and Wildlife Restoration Programs, Bureau of Sport Fisheries and Wildlife, DOI	State government	Acquisition and management of fish and wildlife habitat for research, hunting, and sport fishing
Resource Conservation and Development Program, U.S. Dept. of Agriculture	Local government	Recreation planning, development and land acquisition for local park and conservation projects
Green Acres Program, Rhode Island Dept. of Natural Resources	State and local government	Acquisition and development of state and local park facilities

THE PUBLIC NEED NOT ACQUIRE ALL WATERSHED LANDS.

Easements and covenants

In consideration of the high cost of land, public acquisition of fee simple and easements could be supplemented with a program designed to stimulate voluntary dedications of restrictive covenants and easements on private property. By affixing restrictive covenants to the title on lands, existing property owners can prescribe conditions on the future use of the parcel. If the covenant is designed to prohibit the development of scenic or natural areas, it would have the same effect as scenic or conservation easements. Dedicated covenants and easements could be solicited for the following purposes within the context of the proposed plan:

- to preserve private land holdings within areas suggested for public recreational and educational development
- to preserve scenic ridge, bluff face, and flood plain views within the Narrow River corridor
- to preserve scenic vistas and corridors along watershed roads and highways

While easements and covenants should be sufficiently restrictive to preserve the land, they should also allow land owners to develop private recreational uses that would be consistent with the corridor concept plan (such as camping, hunting, fishing, canoe and kayak rentals).

Dedicated easements and covenants would insure the long term preservation of valuable watershed lands at no cost to the public. In addition, private property owners are afforded tax deductions on their federal income tax returns as an incentive to dedicate their land to public purposes.[1] Since this measure relies entirely on the voluntary participation of landowners, a local organizaton (as for example the commission structure described in the Organizational Considerations Section) should dedicate considerable effort toward stimulating landowner participation in the easement and covenant dedication program.

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[1] See Reading List and Contacts: No 5.

Land Trusts

The creation of a watershed private land trust could also aid in the preservation of open space. Private land trusts are non-profit organizations established to preserve land for the public's benefit through acquisition or dedication of full or partial interests in land. Land trusts are organized under state corporate law as non-profit corporations. As corporate entities, they must be based on a charter defining the purpose and nature of the corporation, as well as on by-laws prescribing the rules under which the corporation will operate.[1] Land trusts have proved effective in Connecticut, New Hampshire, and Massachusetts.[2] Their success as land preservation organizations is partially attributable to the tax advantages they can offer property owners. As an incentive for dedicating land to a land trust, property owners can obtain the previously mentioned income tax reduction.[3]

Since they rely on land dedications, land trusts do not require substantial financial resources. Their principal financial liabilities include property maintenance costs and local property tax obligations. Property tax obligations could be reduced by obtaining preferential tax treatment under the Farm, Forest, and Open Space Act. The Audubon Society of Rhode Island and Rhode Island Heritage Foundation have obtained complete deferral of tax obligations through special legislation in the state legislature.

Preferential tax treatment

Preferential tax treatment under the Rhode Island Farm, Forest and Open Space Act (1968) can be used as an incentive to obtain voluntary dedications of private property for open space conservation. However, this program needs to be strengthened in two areas to render it an effective open space preservation measure. First, local government needs a broader tax base to decrease its dependence on local property tax revenues. As long as local governmental functions are supported by property tax revenue, widespread use of this program will be hindered. Second, the current two year rollback provision designed to penalize speculative conversion of open space land should be lengthened to ten

[1]See Reading List and Contacts: N° 6.

[2]See Reading List and Contacts: N°s 7,8,9.

[3]See Reading List and Contacts: N° 5.

years to make such conversions prohibitively expensive.[1]

These measures, in conjunction with an active program to stimulate private interest in participating in the program, could render the tax deferral program an effective means of preserving open land.

LOCAL GOVERNMENT SHOULD BE PROVIDED INCENTIVES FOR LARGE-SCALE OPEN SPACE PRESERVATION PROGRAMS.

Town revenues in the form of property taxes could substantially decline as the corridor program evolves. The loss in tax revenue would, however, be partially offset by the following:

- local public benefits derived from local access and use of recreational and educational facilities within the park entity
- reduced town service costs in the form of construction and maintenance of utilities, roads, and related public services
- increased tourist trade and concommitant commerce and recreational development in other areas of the town jurisdiction

However, consideration could be given to providing local entities additional compensation for the loss of tax revenues. An equitable arrangement might consist of an annual rollback of state taxes to jurisdictions maintaining large-scale open space facilities in proportion to the real loss in property tax revenue. An alternative approach could involve state tax reforms designed to provide local government new sources of general revenue. Either of these measures would require new state legislation as well as a significant shift in existing state tax policies.

THE NARROW RIVER FLOODPLAIN MAY WARRANT SPECIAL ATTENTION IN THE OPEN SPACE PROGRAM.

Unlike most areas identified as prospective open areas in the corridor concept, the central Narrow River floodplain is fairly well developed. As envisioned in the Plan, the floodplain could provide open scenic vistas as well as public and private recreation areas throughout

[1] See Reading List and Contacts: Nº 10.

the length of the river corridor hand in hand with a reduction in flood hazard to life and property. As described under the environmental management section of the Plan, future development of undeveloped floodplain areas should be minimized through floodplain zoning. Consideration should be given to encouraging and assisting in the relocation of existing homes from high flood hazard areas.

Such a program could be aided by the creation of a special purpose commission endowed with appropriate enabling legislation and financing. The commission could be empowered to have first option on all flood prone property available on the open market. Until such time as a sizeable land tract were assembled, the commission could be empowered to lease each property for continued use. Once a large-enough tract was assembled, the commission could be provided the option of redeveloping for recreational use, or selling the land with appropriate deed restrictions for private development of recreational uses. The leaseback and sellback features could be specifically designed to provide the financial basis for the operating life of the commission.

Through this program, the floodplain could be redeveloped as a functional recreation resource contributing to the enhancement of the natural character of the river, as well as to the local economy, while providing for a fully voluntary framework for house-moving to nearby upland edges above the floodplain and for other relocation options by present home owners, with full compensation and assistance benefits.

RECOMMENDATIONS FOR DEVELOPING OPEN SPACE, RECREATIONAL, SCIENTIFIC, AND EDUCATIONAL RESOURCES.

The following implementation measures will span several years, but should be initiated in the immediate future.

- *State and local governments should be encouraged to acquire and maintain open space, recreational, educational, and scientific research facilities in the areas identified on Map 14. All potential sources of federal, state, and local funds should be explored for this purpose. The CRMC should be encouraged to investigate the possibility of establishing an estuarine sanctuary within the watershed or alternative protective measures for critical watershed areas.*

  State and local governments should be encouraged to develop active programs designed to solicit voluntary dedications of easements and restrictive covenants to supplement open space

acquisition programs. The establishment of a private land trust should be considered as a means of supplementing governmental action toward this end.

- *The state legislature should be encouraged to strengthen the Farm, Forest, and Open Space Act, and to broaden local tax bases to stimulate a more intensive and effective use of tax deferrals as an open space preservation measure.*

- *The state legislature should be encouraged to consider enacting legislation to enable the state to compensate the watershed towns for reduced tax revenue associated with the corridor program.*

- *North and South Kingstown should investigate establishing a special purpose commission to acquire, relocate, or remove over time existing development in the 100-year floodplain.*

ENVIRONMENTAL MANAGEMENT

The environmental resources of the watershed warrant special consideration within the context of an implementation strategy. Because of their vulnerability, concerted action on the part of local and state governments should be instituted to assure their protection.

ILL-PLANNED AND ENVIRONMENTAL DAMAGE CAN BE AVOIDED BY THE ADOPTION OF SPECIAL ZONING ORDINANCES.

The towns should use special district zoning programs to restrict land use development and minimize developmental impacts in several watershed areas encompassing sensitive environmental resources. Through special watershed zoning districts, development should be restricted to open space uses, or developed on a special exception basis according to prescribed standards and a site plan review process. Watershed areas that warrant this level of protection include:

- Coastal floodplains
- Erodible, shallow, and wet soils
- Steep and long slopes and bluff areas
- Water/land and wetland edges

Floodplain development constitutes an unnecessary threat to groundwater quality, particularly when based on septic tank systems.

Floodplain development also incurs unnecessary risks for significant property damage and loss of life. Revising building, health, and sanitary codes to require flood proofing of structures, and to prevent the use of septic tanks are measures frequently utilized to deal with these problems. However, floodplain zoning is a means of fully alleviating development problems in floodplains. Floodplain zoning should be used in conjunction with existing town zoning ordinances to restrict future floodplain development to open space uses.

Development on shallow, erodible, or wet soils and on steep slopes often results in soil erosion and inadequate purification of septic system effluents, as well as higher construction and maintenance costs to the individual or town. While the State Department of Health evaluates the suitability of soils and slopes for septic system development, the towns should consider further evaluation of development on these resources in order to avoid or mitigate the other environmental and cost impacts. As with North Kingstown's overlay districts, the towns could require technical site plan review of development on slopes greater than 15 percent, soils with bedrock or water table within four feet of the surface and with an erodibility factor (K) greater than 0.40. As a management tool, site plan review has the flexibility needed to manage resources for which the type and severity of problems and the range of solutions -- siting, construction techniques, protective measures -- will vary considerably.[1]

The principal problems associated with development on bluffs and water/land and wetland edges are surface and groundwater pollution stemming from increased erosion and septic tank leaching. These problems can be mitigated through standards prescribing minimum setback distances and restricting the clearing and thinning of natural vegetation. (These standards are described in the Appearance and Design section.)

MANY ENVIRONMENTAL PROBLEMS CAN BE CIRCUMVENTED THROUGH SOUND COMPREHENSIVE PLANNING.

Comprehensive planning can be used to identify prospective environmental problems in advance of land use development. Through a comprehensive planning process, the towns can identify potential watershed growth areas and determine the minimum facilities (e.g., sanitary and

[1] See Reading List and Contacts: Nos 11, 12, 13, 14, 15

storm water sewers) that will be necessary to accommodate development without adversely affecting the environment.[1] The facilities should be programmed as future public projects or established as minimum conditions for subdivision approval.

The towns should be encouraged to establish ongoing data collection programs to support this form of planning. South Kingstown and Narragansett should assign high priority to assembling detailed soils information as part of this process. The Rhode Island Department of Natural Resources should also be encouraged to participate in the process by reinstituting the Division of Fish and Game resource monitoring program.

IMPROVED MANAGEMENT OF ENVIRONMENTAL RESOURCES CAN BE AIDED BY UTILIZATION OF LOCAL AND STATE PERMIT PROGRAMS.

Existing authorities of the Coastal Resources Management Council, Department of Natural Resources, Department of Health, and corollary local programs provide a framework within which Narrow River resources can be managed. These resources could be afforded increased protection if the concern reflected in existing permit programs were broadened to include the following:

- The implications of the bedrock valley for the safe and effective functioning of on-site septic systems
- The cumulative effects of a concentrated number of septic systems on the ground and surface waters
- The potential decrease in river water quality from sedimentation and overland urban runoff generated by all watershed developments

The Coastal Resources Management Council, and its evolving critical environmental areas program and associated permit requirements, would provide a particularly effective means of safeguarding key environmental areas within the watershed.

ENVIRONMENTAL MANAGEMENT RECOMMENDATIONS

The following recommendations are organized according to those

[1] See Reading List and Contacts: N^{os} 16, 17

measures than can be implemented under existing legislation and will be effective in the short term, and those whose implementation and effectiveness will span several years (Map 14).

Immediate action

- The towns should be encouraged to establish the following special zoning districts: 1) 100-year coastal floodplain zoning districts on which no further development except recreational and other open space uses would be allowed and 2) watershed protection zoning districts defined by soil and slope conditions within which development would be subjected to additional site plan review. Bluffs would be protected under one category of this type of zoning district.

- The towns and the state should be encouraged to utilize existing regulatory powers to their full extent to manage and protect watershed resources, particularly tidal and freshwater wetlands and water quality.

- Narragansett and South Kingstown should request Soil Conservation Service soil surveys for their towns.

Long-term action

- The towns should plan storm runoff drainage and treatment systems in advance of development and should require developers to construct, donate, or otherwise comply with the plan through zoning and subdivision ordinances.

- The Department of Health or local governments should further study the effect of the bedrock ledge on septic system functioning and the cumulative effects of a number of systems on ground or surface water and should revise building permit processes accordingly.

- The Department of Natural Resources should reinstitute a resource monitoring program for the Narrow River.

- The Coastal Resources Management Council should investigate the possibility of designating key watershed environmental areas as critical environmental areas under the auspices of the Coastal Resources Management Council Act of 1971.

APPEARANCE AND DESIGN

The cultural and natural aesthetic resources of the watershed can be managed to enhance the character of the river corridor and of community development.

THE EXTENT AND DENSITY OF WOODLAND AREAS CAN BE PRESERVED AS CHARACTERISTIC AESTHETIC RESOURCES OF THE WATERSHED.

The natural and aesthetic qualities of the woodland areas can be protected most effectively through acquisition of scenic easements. Landowners could also be provided incentives for voluntary conservation of these resources through preferential tax assessments provided for under the Farm, Forest, and Open Space Act (see Developing Open Space, Recreational and Educational Resources). In addition, zoning standards limiting the cutting of vegetation can be adopted by the towns. These standards should reflect the importance of maintaining both existing canopy trees (except in carrying out forest management practices) and the extent or area coverage of woodlands. The aesthetic and ecological importance of woodlands on the bluff face and crest and at water/land and wetland edges should also be recognized through additional restrictions.

Such an ordinance should specify that woodland cutting shall be permitted only to the extent necessary to undertake the allowed land use. For any use, the maximum clearcut or thinning allowed within a 10 year period should be limited as shown in the table on the following page.[1]

USE OF THE SHORELINE EDGE ALONG THE NARROW RIVER CAN BE REGULATED TO ENHANCE AESTHETIC QUALITY.

The aesthetic quality of docks and shoreline protection facilities should be considered during Corps of Engineers and local review of proposed facilities. Conservation of the natural wetland or vegetated water's edge should be required, with natural and well-maintained plantings to stablize shoreline slopes. If structural solutions are necessary, stone riprap or wood pilings are preferable to concrete walls or boulder riprap. Onland storage of small boats with launching from ramps is preferable to small marina dredging and single-lot docks in terms of shoreline aesthetics.

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[1] See Reading List and Contacts: Nos 17, 18.

Proposed Cutting and Thinning Standards

Area to which standard applies	Maximum allowed thinning or cutting of: Tree > 3" diam. found on property	All woodland acreage on property	Additional restrictions
Bluff face and crest	40%	25% or 10 acres	No building may project above the treeline to a height > 25% of the height of the downhill trees.
Water/land and wetland edges			Within 35' of the edge, no more than 20' for every 100' of shoreline property may be cleared.
Other watershed woodlands		50%	

MAINTAINING AND ENCHANCING THE AESTHETIC QUALITY OF ROAD CORRIDORS IS AN IMPORTANT GOAL OF THE CONCEPT PLAN.

Within the publicly-owned rights-of-way and, with owner permission, on lands abutting the rights-of-way, the state and local governments can utilize existing road maintenance programs to selectively clear scrub vegetation along Route 1A, Gilbert Stuart Road, and Bridgetown Road to reveal stone walls, woodlands, and views of the upper ponds. Although most states do not allocate funds for post-construction landscaping, the Rhode Island Department of Transportation could be encouraged to utilize highway beautification funds for roadside canopy tree planting along Route 1A as a designated scenic highway. If stretches of Route 1 are upgraded to limited access status within the watershed, the state should be encouraged to acquire scenic easements in addition to the right-of-way to include the full visual corridor of the road.

The bay vistas along Route 1A should be preserved, and can be through acquisition of a scenic easement across the foreground of the view. The specific conditions of the easements will vary depending on the character of the existing view, but should include provisions for preventing obstruction of the view with structures or vegetation and

for preventing the development of distractive elements in terms of color, signage, scale, and materials.

The achievement of clustered and compact community development within a context of broad open space areas, as represented by the concept plan, will in general enhance the aesthetic quality of views from the road corridor. For development within the corridor but beyond the right-of-way, design and siting guidelines can be adopted by local governments. Through site plan review of subdivisions and individual homes or businesses, developers should be encouraged or required to retain the roadside canopy trees and hedgerows along Route 1A, Middlebridge Road, and Gilbert Stuart Road. By similar means, development along Route 1 should be encouraged or required to occur behind woodland edges or, in open areas, behind a setback zone defined by existing woodland edges.

The height, size, and types of uses zoned along the roads is appropriate to the aesthetic character of the corridor. On all roads except Route 1, particular care should be taken to maintain this scale and character of uses in the future. On Route 1, larger scale developments could be visually accommodated but should be sited outside the road corridor. While the proposed and existing sign ordinances for South Kingstown and North Kingstown represent strong and effective aesthetic controls, that of Narragansett may not be sufficiently strong to maintain the aesthetic quality of a scenic highway. In addition, the planted buffers required for roadside commercial services or subdivisions should be compatible with the character of existing vegetation: canopy trees on Route 1A and canopy tree masses on Route 1.

Appearance and Design Recommendations (Map 14)

- *In order to protect the aesthetic and ecological values of watershed woodlands, the towns should adopt zoning standards limiting the cutting and thinning of woodland vegetation. Additional and stricter standards should be adopted to limit the extent of acreage cut on the western bluff (North Kingstown and South Kingstown) and at water/land and wetland edges.*

- *The towns should consider the aesthetic ramifications of shoreline protection facilities and structures when reviewing such applications for the Corps of Engineers.*

- *In order to maintain and enhance the aesthetic quality of the road corridors, the towns and state should 1) institute a right-of-way maintenance program for selective clearing of underbrush and vines on Route 1A, Gilbert Stuart and Bridgetown Roads, 2) acquire or solicit the dedication of scenic easements in the foregound of bay vistas from Route 1A, and 3) adopt guidelines for road corridor development concerning setbacks, landscaping, signage, and size of structure, and encourage or require conformance with the guidelines.*

RIVER USE MANAGEMENT

As the various river corridor park programs evolve, the Narrow River could become a means of transporting recreationists from area to area. If increased boat usage on the river and upper ponds leads to excessive conflict with shore resources or other uses, limited forms of boat management may need to be instituted to assure that safety hazards or use conflicts are avoided. As boat use increases, conflicts and hazards will stem primarily from the incompatibility of high speed motorized boating with non-motorized, less maneuverable boats . Institution of a five mile per hour maximum speed limit would provide sufficient basis for controlling these problems. The State Division of Boating Safety could be encouraged to impose and enforce such a speed limit as boat usage reaches an unsatisfactory level.

Shoaling to shallow depths at the river mouth and in the vicinity of Middlebridge Bridge has created problems for motorboat use on the river. Any proposals to solve this problem should be undertaken only after a careful environmental assessment. While the proposed solution of spot dredging in the problem areas and/or Middlebridge Bridge reconstruction to prevent shoaling represents the most "limited-action" approach to problem solution to date, decisions to proceed should be based on an evaluation of its effectiveness in meeting project goals, its impact on river biota and hydrology, its cost in relationship to the benefits, and the effects of potentially increased motorboat use enabled by the project.

RIVER USE RECOMMENDATIONS

- *The State Division of Boating Safety should be encouraged to adopt and enforce a five mile per hour speed limit on the Narrow River as boat usage on the river reaches unsatisfactory levels.*

- *South Kingstown and Narragansett should undertake the reconstruction of Middlebridge Bridge and spot dredging only after careful environmental assessment.*

ORGANIZATIONAL CONSIDERATIONS

A plan combined with an implementation strategy and sound organizational framework can become a reality. The various implementation measures and concepts presented in this report will involve unilateral actions on the part of local governments, residents of the Narrow River watershed, and several state agencies. To assure that these actions are initiated and sustained, as well as carefully coordinated, a well-organized implementation structure may be required. The following approaches describe alternative means of organizing plan implementation.

Existing local and state intergovernmental coordination processes could provide an adequate basis for plan implementation. If all involved agencies wholly adopt the recommendations of the plan, plan implementation could evolve according to the recommended strategy.

The Tri-Town Narrow River Planning Committee could be reorganized, or succeeded by a permanent inter-town commission (or alternatively three separate town commissions) to work with and advise state and local agencies, and private land owners and citizens in the implementation of the plan. The committee or its successor could in effect be established as a permanent managerial-advisory group for the corridor plan.

A new structure could be created in the form of a joint state-local commission to guide the implementation of the plan. The commission could be empowered to monitor local regulation of watershed development and to appeal local decisions if they were inconsistent with the adopted watershed plan. The appeals process should be based on existing appellate entities including, for example, the zoning boards of appeals at the town level, and the appellate structures associated with state permit programs. The commission could be empowered to acquire and hold land and could be provided a permanent source of revenue (perhaps bonding) to finance land acquisition. The Adirondack Commission of the State of New York was established to govern development in and around the Adirondack State Park and could be used as a model for developing the Narrow River Commission.[1]

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[1]See Reading List and Contacts: Nos 3,4.

ORGANIZATIONAL RECOMMENDATIONS

- The Tri-Town Committee should be re-organized or succeeded by an inter-town commission as a permanent structure within the watershed to advise and coordinate the actions of local and state government in plan implementation.

- The state legislature should be encouraged to enact legislation creating a watershed commission to manage the development of the recreational and educational program and land use development throughout the watershed.

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Published by the Tri-Town Narrow River Planning Committee, South Kingstown, R.I. 02879
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